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# *Library Trends*

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*Science Materials for  
Children and Young People*

GEORGE S. BONN  
*Issue Editor*

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April, 1974

# Library Trends

A Publication of the University of Illinois Graduate  
School of Library Science

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LIBRARY TRENDS, a quarterly journal of librarianship, provides a medium for evaluative recapitulation of current thought and practice, searching for those ideas and procedures which hold the greatest potentialities for the future.

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# Library Trends

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GEORGE S. BONN

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# *Introduction*

GEORGE S. BONN

THIS ISSUE OF *Library Trends* has two antecedents, one broader and one narrower in scope: the 1960 Allerton Park Institute on Collecting Science Literature for General Reading, sponsored by the University of Illinois Graduate School of Library Science, and the 1963 Institute on Evaluation of Science Materials for Secondary Schools, sponsored jointly by the Rutgers University Graduate School of Library Service and the American Museum of Natural History.

Over the years there have been other conferences and numerous articles dealing with science materials for laypersons at various levels. But this is the first time, to my knowledge, that such a distinguished group of authors, librarians, editors, reviewers, and teachers have been brought together between two covers to identify the distinguishing characteristics of good science materials, broadly speaking, for children and young people, and to discuss the responsibilities each has to insure the quality of the materials that reach their intended users.

The purpose of the issue, simply stated, is to encourage school and public libraries to build adequate science collections to meet the interests and needs of their younger, as well as their older, clientele, and to assist librarians, teachers, and parents in selecting and evaluating science materials for children and young people of all ages. "Science" here means pure and applied physical and biological sciences including mathematics, agriculture, medicine, and technology. "Materials" means books, periodicals, pamphlets, and other publications as well as films, slides, recordings, and other audiovisuals.

Children and young people are assumed to range in grade level from kindergarten through senior high school, but the materials produced ostensibly for certain grade levels may, of course, be equally useful long before or long afterward. As a matter of fact, many adults often find science publications for younger readers easier to understand (less jargon), easier to absorb (less complicated), easier to enjoy (more

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illustrations), easier to read (larger type), and all-in-all more satisfying (enough is enough!) than regular adult fare.

An adequate science collection is taken to mean whatever is needed to meet the interests and needs of a library's clientele of children and young people. In the previous editions of the *AAAS Science Book Lists* (1963 and 1964), Hilary Deason suggested that the science-technology holdings in a modern secondary school library should be at least 20 percent of the total book collection,<sup>1</sup> and that in an elementary school library this proportion should be not less than 25 percent.<sup>2</sup> However, the current editions of these *Book Lists* (1970 and 1972) are not so specific.

Now about this issue of *Library Trends*.

The first two articles are by well-known authors in the field, one discussing what he feels young readers are justified in expecting from their science books and the other describing many of the problems authors must face when setting out to write a science book for children. These are followed by a broadranging interview in which a public school coordinator of instructional materials asks searching questions of two prominent junior-science book editors, both of whom happen to be members of the Children's Book Council and on its joint committee with the National Science Teachers Association (of which the first author in this issue is chairman).

The next two papers are by the editors of the two important reviewing journals in the field, *Appraisal* and *AAAS Science Books*, each covering the development, the philosophy, and the policy of her particular journal. These are followed by reports from two librarians, one a coordinator of library services in an elementary school district, and the other a former young adult public librarian, talking about the responsibilities each has in evaluating and selecting science materials for her level of library users. Then we have a straightforward presentation from a science teacher who also can speak with authority as a science fiction writer and as a science book columnist for *The Horn Book Magazine*.

It may, but I hope it does not, come as a surprise to some people that a good bit of science writing can qualify as "literature," and the next paper demonstrates quite clearly and authoritatively that this is so. The last four articles, by specialists in the three areas, present outstanding representative current titles of science periodicals, of science reference works, and of science audiovisual material for readers, viewers, and hearers of all school grade levels.

It has long been considered a truism that any published list of titles,

### *Introduction*

especially of science titles, is out of date from the moment it is first conceived. Nevertheless, I feel that the benefits outweigh the possible mischief that such lists (as are included in this issue) could cause. Alert readers will become aware of important *authors*, *publishers*, and *types* of works as well as of significant titles that may have been overlooked previously. The better (and often the more specialized) titles will stay in print for some time or will be regularly revised and updated; the others will not, but alert readers will know this soon enough to choose accordingly. Alert readers also will know that no published list is ever prescriptive for a particular library or collection; each list is at best only suggestive as to what is available and likely to be useful in average situations.

In any case, alert readers of this issue of *Library Trends* will be able to recognize reputable authors, publishers, and producers of science materials for children and young people, will know what to look for in reviews of these materials, and will be aware of the distinguishing characteristics of good science materials that should be present in the titles they select for their libraries or for their own use.


The contributing authors, librarians, editors, reviewers, and teachers, each writing from his or her own experience, and often confirming but always supplementing and reinforcing each other's views, have together produced a *Library Trends* issue that can be useful for some time to come. After all, science materials for children and young people will be around as long as there are children and young people.

### *References*

1. American Association for the Advancement of Science. *AAAS Science Book List for Young Adults*. Washington, D.C., AAAS, 1964, p. ix.
2. ————. *AAAS Science Book List for Children*. Washington, D.C., AAAS, 1963, p. vii.



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# The Author and the Science Book

GLENN O. BLOUGH

PERHAPS THIS PIECE should be called "Rights of the Reader" since it considers some of the more important characteristics children and young people are justified in expecting from their science books. Unless they are satisfied, we authors have failed. Unless we have in mind certain legitimate objectives and how to the line to achieve them, we are almost sure to waste their time and ours. Although some of the intentions and methods are the same for both library (trade-supplementary-auxiliary) books and textbooks used in connection with the science curriculum in schools, we are concentrating here on library books.

## ACCURACY OF CONTENT

Informational books commit themselves to tell the facts and ideas as far as they are known and to the extent that they can be understood by the intended audience. This is not always as easy as it may seem. Sometimes the whole truth is too complicated to include. Sometimes it is not known or only certain factors are known, and sometimes authors are inclined to tell more than readers care to know. Despite these situations, readers have a right to read dependable information. If authors write only part of the story they should admit it. It is often appropriate to include qualifying phrases such as "as far as scientists know at present," "many scientists agree," "evidence seems to indicate," "there is disagreement about," or "the latest findings are." Having thus qualified their statements, authors can only hope that teachers, librarians, and others who work with children are helping them to learn how to evaluate what they read in light of such qualifying statements. Sometimes the biggest problem is to decide what to leave out and still have a meaningful story.

Because scientific information grows by leaps and bounds and so-called facts change, especially in some scientific fields, revisions of

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books for any level are frequently in order and readers are entitled to have such revised editions available; adults charged with book selection must attempt to be knowledgeable about the new editions. Having up-to-date information is part of a book's reliability.

Since pupils are urged to evaluate the factual material they use, the practice by authors and publishers of indicating when the text has been checked for accuracy by well-known authorities should be encouraged. Information about the qualification of the author is also appropriate and highly desirable. Pupils should grow in ability to judge the authenticity of the books they use; they cannot do this unless they have such background information at hand. Including such information in the book itself, as well as on the dust jacket, is commendable since jackets are frail.

Pupils should also be urged to go to several sources to double check facts, figures, and other information. This necessitates making several sources available and encouraging pupils to use them. "What makes you think that your information is reliable?" is as important a question as "What did you find out from your reading?"

It should be emphasized that the fact that information grows and ideas change is no excuse for not expecting children and young people to learn some science. While the great supply of information may be somewhat discouraging, and the fluctuation of ideas disconcerting, neither is an excuse for remaining ignorant of the world we live in, or not understanding the methods by which knowledge grows.

When considering accuracy, the matter of anthropomorphic explanations is an important one. Assigning human characteristics to animals is frowned upon, and rightly so. When the intention is to provide information, talking, reasoning animals, sleeping plants and other such fantasies are hardly appropriate. Relatively few books now suffer from this affliction; only occasionally do authors and publishers resort to such devices in attempting to communicate with children.

#### STYLE OF COMMUNICATION

There is no substitute for a straightforward, well organized, interesting presentation. The idea that fascinating information must be cloaked in conversation between an all-knowing Uncle Albert and a super-curious precocious nephew can be questioned. Writing down is out. Underestimating the mental capacity of children and oversimplifying are annoying to many children who approach science books with interest and curiosity. They have reason to expect authors

to know the capacity of their audiences as well as to have the ability to write for them.

Science textbooks used in schools are more often than not vocabulary and concept controlled, which makes for easier reading. It also sometimes bores readers. There is a happy medium between "Jump Spot jump" and "The heart rhythmically circulates the blood through a complex system of arteries, veins and capillaries." At best the first does not communicate much; neither does the second, but for a quite different reason—it assumes more background and information than most eight-year-olds possess.

The most successful trade book authors recognize some of the common reading hazards for children and try to avoid them. They also avoid packing paragraphs with technical vocabulary that is not essential to understanding. Science is indeed exact, but there are often easier ways to express exactness than to discourage readers by too much technical language. Setting a word in italics does not help pupils who are encountering the science word for the first time. Defining it in appropriate language, using it in familiar contexts and re-using it when appropriate does.

Too much technical science vocabulary is not the sole block to understanding. Stating science principles and generalizations without sufficient development and illustration is equally hazardous. The big ideas in science are made meaningful to children through experiences, anecdotes, explanations, word and picture illustrations, and through many other avenues. "Ecology is the relationship of living things to their physical environment" is, for example, meaningful only if the reader has something to bring to the sentence and some help in unlocking its meaning as he reads it. While space limitations are sometimes a real handicap, not much is to be gained by packing the space with generalizations that continue to remain a mystery after the reader has wrestled with them. Teachers know that attempting to cover too much material too fast results in a need for reteaching. They have learned that the process of discovery cannot be hurried. So it is with the printed page. A relaxed writing style that gives readers time to think and a logical development to learn from often makes the difference between enjoyment and satisfaction from reading and taking the book back to the library with disappointment.

We have all had the experience of asking directions to some desired destination and receiving them in such a disorganized and garbled way that we wish we had not asked. Children sometimes have the same difficulty in reading explanations or directions. Writers should put

themselves in the place of their readers and think through an explanation by asking themselves, "What can I reasonably assume that the reader already knows?" This is sometimes difficult to answer, but always desirable. The writer then determines the logical place to begin the explanation, decides what comes next, then next, until the explanation is complete. Good teachers are able to do this and can make what seems to be a difficult idea appear easy because they have talent for arranging ideas in logical order and can show and help children discover the relationship of one idea to the next. Good writers are substitute teachers in this respect. They keep in mind that, as far as they know, the only help children will have in unlocking the meaning is found in the words they read. This puts a heavy responsibility on the sequence arrangement of words, sentences, and paragraphs. A question for authors might be: If I did not already know this, would I learn it from reading this passage?

Content and writing styles often reflect the experiences of the author. A science writer who himself has never observed what happens in an ant hill, assembled a model airplane, nor grown a plant from seed is less likely to be convincing and clear to readers than one who has had these experiences. Deficiencies in such first-hand experiences are frequently apparent in science books for children.

An author who is limited in experience with children is probably equally limited in communicating with them. Knowledge of children's interests, the kinds of questions they ask and the kinds of answers that satisfy them, their skills, limitations, attitudes, reading difficulties, etc., show up in the end product. A writer of science material must have more than an extensive knowledge of the subject matter, important as that is. He also must have a knowledge of his audience. Such knowledge can only result from wide contacts with a variety of children. It is folly to base conclusions on the reactions of one's own children or those in the neighborhood who like the author and often agree with anything he attempts.

#### OBJECTIVES

Science books for elementary school children intend to do more than inform. They also intend to introduce children to the methods of science—how scientists have come to know the facts and ideas, how they observe, experiment, compare, formulate hypotheses, test them, draw conclusions or withhold them until more evidence is uncovered. There is currently much emphasis on helping children learn how to

learn, to investigate and inquire on their own the ways commonly used by the scientists, and to become involved with the science around them. The use of instruments in scientific discovery is an important part of scientific processes. Their use in gathering data is an important element with which children need contact. For example, accurate temperatures obtained by the use of thermometers, instruments to measure wind speed and direction and air pressure are all a part of learning how to learn about weather forecasting.

Part of introducing children to the methods used by scientists consists of acquainting them with such attitudes of scientists as: observing patiently; gathering data from many, varied and reliable sources; withholding judgments until the facts are in; and trying not to jump to conclusions. Some books attempt to emphasize this aspect of science learning and they are most successful in accomplishing this if they employ examples and anecdotes that are meaningful to children.

Books also try to inspire appreciation and interest on the part of the reader. Not all books attempt to do this, but when they do they must be able to make contact with the reader through appropriate words, descriptions, and illustrations. Such books often raise questions as well as provide possible solutions; they make concrete suggestions of firsthand experiences for children which may help them develop such interests and appreciations.

Development of interest and appreciation is not easy, especially when the author has only words and pictures to help him. Firsthand experiences are probably the best approach, but there are many books that inspire readers to explore on their own, observe their environment, experiment and see things for themselves by including practical suggestions and helpful descriptions. Here again the experiences, interests, and appreciation of the author are often evident—or lacking.

#### PROGRESS

Examination of the hundreds of books currently published annually, compared with earlier volumes, indicate that we have indeed come a long way. Physical appearances are now pleasing. The subjects are timely—a panda book arrives in time to provide information about Ling-Ling and Hsing-Hsing, and a skylab book is available at just the appropriate time. Books generally are appropriate in content and writing for the intended audience. Furthermore, hundreds of children find such books available in their local school and public libraries.

The treatment here seems incomplete without a statement of a fundamental question: *Have we made as much progress in the effectiveness of the use of books with children as we have in their production?* In some places the answer to this is "yes"; in many others it is "no." When asked "How many people work in your organization?" an international religious figure replied, "I estimate about one-half!" I hope that we are using more than this fraction of what we know about providing the right book for the right child and helping him to use it most effectively. There is still much to be done in translating our knowledge of children and books into actual practice. There is no question but that we are making progress. The question may be: Will we live long enough to use our knowledge to the fullest? Could we perhaps make faster progress? A quiet, beautiful, well-stocked school or community children's library does not necessarily mean that books and children are meeting in the most effective and efficient manner. Along with legitimate concerns about book processing, budgets, attractive surroundings, etc., let us be as sure as possible that the real function of writing, editing, publishing and using books is not lost in the shuffle.



## Characteristics of Good Science Materials for Young Readers

ILLA PODENDORF

PERHAPS THE FIRST and most important question to ask oneself when beginning to write a book for children is: Why have I chosen this subject? Is it because children are particularly interested in it? Is it because there is a need for a book about this particular content? Does it offer an unusual opportunity to present accurate understandings of science as a method or as a way to make discoveries?

If the answer to at least one of these questions is positive there is good reason to proceed to develop the manuscript in the best possible way. If, however, the answers to all of the questions are negative the would-be author needs to reconsider the reasons for wishing to write the book. Maybe the subject is chosen because the writer is particularly interested in the subject and writing about it is an attempt to fill a personal need. In this case another body of content for the book should be explored unless the author is confident the book can be developed in a way that would satisfy the requirements of a good science book and create an interest on the part of the young reader and, just perhaps, demonstrate that there is a need for such a book. It should be remembered that a good science book provides opportunities for children to feel the excitement of discovery and the dignity of performance in an acceptable scientific manner.

Having satisfied oneself that the book meets the needs of a good science book and that it should be added to the literature, a more detailed selection of content is in order. The selected content should lend itself to an orderly and logical sequence. It should also be selected with consideration for the possibility of presentation with complete accuracy. If there is danger of incompleteness or overgeneralization in a way that would lead to error in the understanding of any part of the content, that particular part should be omitted.

The following demonstrates how a statement may appear to be accurate but actually lead to inaccurate inferences or understandings.

Illa Podendorf is an author of science books for children and young people.



Plants use carbon dioxide and give off oxygen whereas animals use oxygen and give off carbon dioxide. As stated this is accurate, but it is a dangerous statement to make because one possible but inaccurate inference is that plants in no way need oxygen and that animals in no way need carbon dioxide.

It is true that to write about science, authors need to know science. The above example illustrates that the author needs to know science to write about it, and it also illustrates that the author needs to consider the basic processes of science as he prepares his manuscripts. Some high school teachers have found it necessary to teach and reteach the needs of plants and animals for the gases of the air because of such errors as the one described. It may be wiser to decide against including this particular content unless it can be presented so that the reader can read it without danger of false inferences.

There are other ways in which material can be oversimplified. Statements such as, "All mammals give birth to their young" is for the most part correct, but there is one and maybe more exceptions. Thus the word *all* makes the statement incorrect. Adding the word *almost* in front of the word *all* is a safer way to present the idea and would make it read, "Almost all mammals give birth to their young." Other examples of more accurate phrasing are "Robins usually fly south in the winter from the place where Jane lives," or "Jane almost never sees robins at her feeding station in winter." Phrases such as almost all, nearly always, and usually are often more accurate than the more exact words such as all, always, and never.

Children need to become familiar with the idea that the natural environment is an orderly one and that there are definite patterns, but that there are also constant and newly found exceptions to almost all of the rules and/or laws which make up the patterns.

There is currently much discussion about science being more than a treatment of facts. Many of the new elementary science programs go beyond the content as such and deal with methods of science in terms of process development; some of them are weighted heavily on the side of process development. This is also true of junior and senior high school science curricula. This development has implications for the would-be author of science books for children of all ages.

Using any of the five senses is a basic way of obtaining information. Observing with all of the five senses is one, if not the most, basic process of science. It is not uncommon to make reference to observing, but it is uncommon to pay attention to particular observation skills such as looking, listening, touching, smelling, and tasting. All reference to

observed activities or facts should be actual observations made by one or more of the senses and not inferred ones. Observations identify characteristics that are directly perceived through one or more of the five senses, whereas inferences involve an interpretation of the observations.

Consider the following: "The little raccoon went into the woods where he was safe from his enemies." The first part of the sentence can be easily observed in a picture, but whether or not the little raccoon was safe from his enemies is an inference. The sentence might better have been written as follows: "The little raccoon went off into the woods where he is most likely safe from his enemies." If the author wishes to stress the use of the process names, the sentence could have been written thus: "The little raccoon was seen to go off into the woods where it can be inferred it will be safe from its enemies." This author, however, is not recommending that process names be used on all possible occasions. This practice could easily result in very dull reading.

Another process needing careful consideration as authors prepare manuscripts is classifying—a way of imposing an order on a collection of things or objects. Many trade books and textbooks make reference to classification facts which have been handed down from scientists over a period of many years. For example: vertebrates are divided into five groups—mammals have fur, birds have feathers, fish have fins, reptiles have scales and lungs, and amphibians live part of their life in water and part on land. It is easy to leave the reader with the idea that vertebrate animals can only be classified in this way. Actually children are able to find many ways to classify animals and in so doing get a much better idea of classifying as a process.

There is no harm, however, in helping children to learn how scientists have classified vertebrate animals. Neither is there harm in presenting children with the system of classifying rocks in a way scientists have done it—igneous, sedimentary and metamorphic groups. It is wrong to give them the idea that this is the only way that rocks may be classified. Given proper activities children find other ways to classify them, i.e., characteristics such as color, hardness, or by texture. Classifying as a process can best be illustrated if more than one way to classify is presented. Presenting classification in this way has the advantages that children may get the idea that there is no one right way to classify and that their own ideas are valuable and useful; thus participation in individual thought and activity is encouraged.

Measurement is another process that plays an important part in science investigations and should be given a much more important

place in science trade books than it often is. Experience in the use of the metric system, selection of units of measure, use of fractions to help interpret sizes and scale drawings are all important and should be incorporated in the manuscripts any time they add to the clarity of the presentation. Most science programs are putting particular emphasis on the use of the metric system since it has become more and more generally accepted in this country. It has been found that small children are able to use the system either as their only system of measurement or in addition to the British-American system with no apparent difficulty. In view of this it is entirely appropriate in the preparation of trade books to express measurement in the metric units only or in addition to the British-American units.

There are skills in the area of communication which are especially important in science. Graphing, illustrating, recording, and reporting are some of them. An author should make use of all opportunities in preparing a manuscript to use any of these and/or other communicating skills in an appropriate way.

Words are a medium of exchange in communicating. They should be carefully selected, especially as they relate to a technical vocabulary which is sometimes necessary in science. At an early age children are able to read and interpret graphs and can present their own ideas and findings in graphic form. A trade book which provides such experiences is a valuable addition to their literature. Any opportunity to help children get experience in interpreting data and making predictions from recorded data should not be overlooked. Such experiences often result in activities in which children can become actively involved. The temptation to present a dictionary definition should be avoided, even though there may be nothing wrong with the definition except that it will not fit into the text and thus not provide an accurate meaning. It is much more productive to develop an operational definition of the new words as they become useful.

Many basic processes such as those described or indicated are included in experimentation. Any time an author has included descriptions of experiments already done or can propose experiments to be done, interest is heightened for most young readers. Children get a lot of pleasure and excitement from what they believe to be "a real science experiment." Because of this the word has often been used in less than appropriate ways, and care should be exercised in the use of the word "experiment."

An experiment should be more than an interesting activity. To be acceptable, an experiment should have a question to be answered,

done with techniques or procedures clearly understood, and have a testable conclusion. Other characteristics of an experiment, such as control of variables and making predictions, may not be evident in all experiments, but they should be clearly pointed up if it is possible without detracting from the interest. Children should be left with the feeling that the activity or the experiment is something they want very much to do for themselves.

This author does not imply that experimentation should be given a lesser place in the development of manuscripts for children's books, but that it should be given greater and more accurate scientific development. Vocabulary which deals with the scientific method should be used accurately and as often as it adds to the skill of carrying on scientific investigation without detracting from the reader's interest.

Mention has been made of the use of terms and vocabulary related to scientific method. There are other specialized or so-called "big words" which may prove difficult for the young reader. This author has followed the practice of using the needed vocabulary if it and it alone carries the message. If the word can be used more than once and in a context that makes the meaning clear for the young child, then it is the view of this author that it should be used. It follows, of course, that the number of such words in any one section of a book should be kept at a minimum. If the so-called "big words" are necessary but are feared to be troublesome, then the art of illustrating may add meaning and provide help for the reader.

Vocabulary should also be considered carefully for the older, even high school, readers. Older readers can handle more difficult vocabulary, including sophisticated scientific terms and constructions, and take great pride in so doing. However, they are able to read and participate more actively if they find the reading intriguing, challenging, and, at the same time, not difficult.

A criticism often made of material written for children is that it is anthropomorphic. Any material that treats animals as though they have human characteristics can be said to be anthropomorphic. There is at this time considerable research going on in an effort to determine how and why animals behave as they do. Some of their behaviors are remarkably human-like, but in no way should they be explained with phrases as though they were human behavior. "Little butterflies love flying about in the sunshine," and "The geese came swimming down the pond in a straight row. They like to play follow the leader," are examples of anthropomorphism.

When purpose is ascribed to anything in the natural environment the materials are said to be teleological. "The leaves of the plant curl up in the hot sun to prevent loss of water" and "Squirrels bury acorns in the ground so they will have food in winter" are well-known examples of teleological material. Many of the earlier science books which were very popular with children can be criticized because anthropomorphic and teleological phrases were common in them. It is an easy trap to fall into in an effort to make the material interesting and exciting. Aside from being anthropomorphic or teleological, such material, however interesting to children, may lead to wrong ideas and overly simplified ways of thinking.

Pictures, photographs, drawings, or diagrams add much to any material developed for children. These should be as carefully selected, prepared, or considered as the written word. They should be simple without being inaccurate if at all possible. They should be fitted carefully to the script, and as far as possible do what the written word cannot do. The location of the pictures, illustrations, or diagrams is also important. It should be easy for the reader to find the picture and then refocus on the text without loss of time or delay in thought development.

Any pictures that present several ideas may be confusing to the reader. They may be attractive and add interest to the book at a glance, but on closer examination prove to be less functional and may even provide distraction in trying to fit text to the diagram. The question: "Is this bit of art worth the space it occupies?" should be answered in the positive for each diagram, photograph, or illustration proposed for the manuscript. Nonverbal representations are useful in prepared directions for activities. Symbols, arrows, and outline drawings of pieces of equipment can be substituted for words. This adds to the interest of a page and at the same time may reduce the vocabulary load.

A real plus in evaluation for any book for children is the knowledge that it will continue to be functional for them after they have "put the book down." After they have finished reading the book they may spend considerable time thinking about what they have read, asking questions based upon what they have read, duplicating some of the activities or experiments described, or developing related activities or experiments in a creative way.

More and more trade books are coming on the market, and it is becoming less difficult to acquire a collection of enrichment reading materials to accompany a science curriculum suitably. To produce such materials has been a special challenge to authors. This challenge is still

### *Science Materials for Young Readers*

very much in evidence and many authors are making a sincere effort to meet the challenge in a way it has not been met before.

There is another special challenge for teachers—to find new and better ways of interesting young readers in quality reading materials beyond the textbook. Many science curricula for young children are not accompanied by a so-called textbook. Curricula for older children may be accompanied by a recommended book but may also depend heavily upon enrichment reading materials. Teachers then need to find, select, and decide more specifically upon the reading references as well as to guide the students in their free reading choices. Many teachers find a need to change their teaching techniques or methods and to be less dependent upon the course outline as prescribed through the textbook, if there is one. They need to become more involved with the trade books and other enrichment reading materials. Teachers and librarians need to work together to interest children in a quality reading program to accompany their subject matter areas of which science is a very important one.

This article does not intend to convey the idea that all science books for children should be factual and curriculum-oriented. Quite the contrary, it is the intention of the author to support a great variety of books being published and a part of the available literature. All books should be described, and the identity of the contents should be portrayed as honestly as possible, which would be helpful to librarians, teachers and children as they make their selections for free reading or for course work. If there is fiction included it should be so indicated. Children should not be expected to separate fact from fiction as they read, especially in new and unfamiliar areas. With the concerted effort of authors and the guidance of librarians, teachers and parents, children should have available a wide range of scientific literature and be able to make appropriate selections in line with their personal needs and interests.

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## The Juvenile Book Editor: An Interview

by  
D. PHILIP BAKER  
with  
HOWARD E. SMITH, JR.  
THOMAS G. AYLESWORTH

BAKER: Let me open with some questions which deal with your specific job responsibility as book editors. How do you find the author? How do you work with the author as he or she develops a manuscript? How do you go about editing? How aware do you have to be of what the market is going to be? In other words, what is your technical job as an editor of a book?

SMITH: First, most of the authors find us. We get in touch with authors in many ways. A great many of the authors are repeats; they have done books for us before, and we have a working relationship with them. Some are people who have worked in education or they have had certain adventures, such as a scientist who may have gone to the Antarctic who wants to write about his experiences. These people may write to us. Some of the authors come in through other authors, other editors, or agents. A very small fraction of our manuscripts arrive unsolicited.

AYLESWORTH: Let me pick up on the point of unsolicited manuscripts. We do, of course, get hundreds and hundreds of them every year, but they are all read. The most obvious reason we do not publish more of them is that many authors cannot write. That is a terrible thing to say, but there are people who cannot write.

Another reason is that the writers of these manuscripts may not have checked the competition on this or any other publisher's list. For

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example, the state of the art is such that almost every publisher has on his list a juvenile book on basic ecology. So there is no point in publishing another book that will be in direct competition with something on his own list. If someone were to submit an excellent book about earthquakes, it is doubtful that it could be published since there are fifteen to twenty books in print about earthquakes—written especially for youngsters.

Another type of manuscript that we must reject is one written by an author who has not investigated what kinds of books our company does publish. He sends us teachers' guides or textbooks, or other types of material that we just do not handle, such as pop-up books or books with records inside them. There is nothing wrong with these types of books, but we just don't publish them.

In reference to getting a book started, I would guess that at least three-quarters of the books that I handle start as editorial ideas. Then I look for the proper author, who is often someone we have already published. On the other hand, authors do come in with ideas that are then, in a discussion, modified somewhat. We must, because of the nature of juvenile publishing, be sure that a book will be popular. For example, there is nothing that I would rather edit than a book on the flora and fauna of Central Park in New York; but I have to decide whether or not it would sell in other parts of the country. Chances are it would not. Juvenile books are usually not blockbusters in sales, so we must pay attention to the market across the country. Our books cannot be too highly specialized.

After a book is thoroughly planned with the author, we wait for the manuscript to arrive. At times we must contact the author because he is late, or because we have come up with some new information that we want to be sure he has included in his book. When the manuscript comes in, it is edited and copy-edited. Then, when the galleys arrive, they have already been proofread. The author, naturally, can make his own additions and subtractions from time to time. Finally, at the end of this whole process, a book appears.

Of course, all the time the book is in production, we have other duties: planning the jackets, writing the flap copy, arranging for some sort of publicity or promotional activities, and alerting our salesmen to the pertinent points of the forthcoming book.

BAKER: I am interested in the way that you discover authors you think are particularly worthy of being brought to the attention of readers, and if there is such a thing as a "hot" author in the field of juvenile science books.

*Juvenile Book Editor*

AYLESWORTH: I suppose there are such things as hot authors, but they may have started as cold authors. There are a few science writers whose very name on a book can sell it, but they started with a good idea. This idea could have come either from the author or the editor. And, if one piles one good idea on top of another, and the sales force gets to recognize the name of this author as a good solid producer, one suddenly finds that one has what might be called a hot author.

SMITH: I disagree to some extent. No one comes to us empty-handed. We already know his experience and some of the things that he has already written. The idea that the editor develops this author from nothing is, I think, wrong. The people we have dealt with either have a lot of teaching experience or we saw a good solid manuscript from them before we went on. Before taking someone, we will often have long discussions with him to size him up. It is only fair to the public that will read the book that we do so. I feel that hot, or at least lukewarm, authors come into our offices, not cold ones.

AYLESWORTH: Perhaps I did not make myself clear. What I mean by a cold author is the type of person who has never written juvenile books and who does not have any ideas about writing them. He may be someone who has written good adult science books or good school science textbooks. But certainly he will have had some sort of experience that will lead us to believe that he can also write a trade book for youngsters. And I certainly agree that a lot of talk is important before the author starts writing. That way, both the editor and the author know what the desired product is and there are no misunderstandings. Obviously this is impossible in the case of fiction, but it certainly can be accomplished in informational books.

BAKER: I want to ask a question concerning trade book publishing, and, specifically, the fiction book as opposed to the nonfiction book. If there is any attempt to assign a priority, do you feel that it is more important to publish well-written nonfiction science than well-written fiction science? This might range into such fields as fictionalized biographies of scientists—the Curies, Pasteur, people like that. What are you actually looking for in terms of making decisions about fiction as opposed to nonfiction?

AYLESWORTH: To begin with, I do not think I have any priorities on this. Any reading person should enjoy both fiction and nonfiction. He may lean one way or the other, but he does not stick to one and ignore the other. As far as criteria for fiction in the areas of science, I feel there is nothing more dishonest than putting out a highly fictionalized biography of a scientist. One of the difficulties that a biographer comes

across is to try to set the dialogue in the country and time that is appropriate. I rather doubt that Pasteur ever said, "Gee, whiz." Too many biographies have been filled with made-up languages and paragraphs that start, "Little did Einstein know. . . ."

Concerning another type of fiction—science fiction—I have a very definite bias. I cannot really appreciate the type of science fiction that consists of monsters and made-up language. We have all read things in which one character is said to mount his grilk while eating a mauga and fly off to the planet of Hermes Trismegistus. It seems to me that good science fiction, although it may be set in the future, takes science as we know it today and extends it just a little. For example, at the time when so much work was being done in attempting to learn to communicate with dolphins, I edited a book set in the future in which man could actually talk to dolphins. That is taking science and pushing it a bit and everything follows logically. That is good science fiction.

SMITH: I have never edited any fiction, but I am always glad when my department brings in a good novel. A good reader is going to read novels and science. As for fictionalized biography, the very term is offensive. Biography should not be fictionalized. These were real people working with real events in real times, and the closer the biographer gets to those concepts the better the biography is.

A great burden is put on the biographer in that in a few pages he has to create a whole life, a whole time, and a whole feeling for the problems confronted by the person he is writing about. In a way, he has to have the reader respond to this person the way the reader would respond to major characters in fiction and has to elicit the reader's responses in much the same way.

As for science fiction, I think it is ideal in some ways for reluctant readers. It is one way that a person can get into an imaginative world easily without too many intellectual demands. We have done some science fiction with this in mind and I have gone to science fiction conventions. This was the general feeling among the writers at these conventions. There were many English teachers who were there, not because they were interested in science fiction per se, but because they felt that this is something that their reluctant readers could get into. I do not know exactly where one would draw the line between science fiction and fantasy, but I feel that in fantasy and in some kinds of science fiction, a good writer can really show us the limits of the human imagination. He can play around with no holds barred and we can see what the human can really dream up. I find this fascinating, and I believe that many young people also do.

*Juvenile Book Editor*

BAKER: Which is more difficult to produce and sell—a book of science involving fiction or a book of science nonfiction for the juvenile market?

AYLESWORTH: In a way, it is impossible to answer that question because the two types of books may go to two different markets. The nonfiction very often goes to the young hobbyist or to the person who really enjoys science facts. The fiction tends to go to the person who prefers fiction. However, assuming that both books are excellent books, the science fiction will have the larger sale for the first year or two. The good, solid science informational book will keep on at a slow steady pace, and probably will stay in print longer than the science fiction book.

BAKER: I wonder if you could discuss the characteristics of good science materials for young people.

SMITH: The first characteristic for a good science book is that it should succeed for the reader—that the reader, after finishing the book, knows more about a certain subject. Also, the questions that he raises should be answered in the book. Equally important, of course, the information should be accurate. Another characteristic of a good science book that a publisher must consider is the range of the material. For instance, most readers would be interested at some point in their lives in a book about dinosaurs. A few readers might be interested in finding a rare mineral which could only be found in one locale in America, but a publisher probably could not publish a book about it because of the limited sales. Such a book would have to appear as an article in a magazine or possibly a local newspaper.

There are several types of information. The author may suggest a nondangerous experiment for the reader to do. The writer should perform every experiment that he writes about to see that each will succeed safely. It is also valid that some books awe the reader. I think that certain scientific subjects are worthy of great interest, such as books about dinosaurs, prehistory, earthquakes or great space exploration. If these books arouse the reader and make him interested in either the solar system or the lives of scientists, I think this is desirable. If they arouse him to social needs or to the uses of science—such as in pollution or medicine—that, too, would be good.

Obviously, there are many different types of science books and each one would have to be judged on its own merits. Accuracy is an important factor in the value of science materials. Most publishers make a great effort to see that manuscripts are accurate, to be sure that the author knows what he is doing. At McGraw-Hill the manuscript is

then edited in the house and also sent to outside readers who are experts in the field. The manuscript may also be sent to people who work with school curricula to see if there is a tie-in there. Whatever the demands are, we try to meet them.

Another characteristic of a good science manuscript is timeliness. I think that every science editor secretly prays that technology continues to rush forward so that he may get new books rolling on the subject. We are fortunate, in a strange way, that there is always a demand for up-to-date science books. For instance, it is absolutely amusing to read a book printed as recently as the 1950s about space travel—any aspect of it. Timeliness is a big factor in our science effort.

BAKER: It appears that a prime responsibility of an editor should be to anticipate trends or developments in the field of materials for young people before they actually become general knowledge. What do you, as editors, do to keep yourselves informed to prepare for what lies ahead?

SMITH: First, I talk with writers who are constantly aware of new developments. Secondly, I read many magazines. I talk to people in schools and to librarians, when possible. I find talking to other editors and people in the field very helpful. But ideas are sometimes like gold—they are where you find them. Sometimes a casual remark in a conversation, or a thought while waiting for a train may trigger an idea for a book.

AYLESWORTH: I have picked up book ideas from reading daily newspapers and watching television. I try to get to local and national science fairs as often as possible just to see what the bright science-oriented young person is interested in this year.

BAKER: In our society today single issues are rarely single issues anymore—they are related. I am thinking specifically of pollution which has overtones in terms of politics. How do we marshall the resources of the country to deal with it as a political problem? It is an economic issue, too—how do we pay for it? And, scientifically, how do we apply technology? Is there an attempt on your part to bring to the attention of young readers methods whereby these three elements are combined?

AYLESWORTH: We have published a number of books on ecology for young readers. I think that every one of these books urges youngsters to get active. That is, it is hoped that after they have read the book, the readers will have learned some action patterns from it. I realize that a book is not the best way to get anyone excited about action, but it is the only method at a publisher's disposal.

We had a strange example in the ecology field a few years ago. I had edited a book for young people on noise pollution and it sold practically nothing in the first year. Then the whole country got excited about noise pollution and the book took off. We are trying to spur the youngsters to action, but we also know that sometimes the subject must be important to them before they pick up the book.

SMITH: I see a distinct trend in science books for young people today. Youngsters feel the pressure of politics, science, and economics more than before. They look around them and see pollution. They often blame science and technology for the pollution they see. In the 1920s, and up to 1950 or so, science readers read books on how to make a shortwave radio set and they would say, "Wow! Isn't that great? Isn't science marvelous? Think of all the things science will bring us!" Today the attitude is very different. They know what science is bringing. It has brought, in some kids' minds, pollution. They feel the Viet Nam War was run and operated by science, technology, and certain economic factions in the United States. They are very aware of this. I feel that publishers have a responsibility to discuss these problems in books. I feel that in the near future publishers are going to have to put out more books in which science is discussed in relation to its impact on society. This, of course, goes into areas of politics and economics as well. We cannot differentiate these aspects in simple experiment books. Indeed, some of the readers who are getting our books may be turned off by science—they may actually despise it. For instance, many of them feel that we have put a lot of money into the space program and not into urban problems. Maybe men did walk on the moon, but young people have to walk among garbage cans and junkies, and they see the difference. The publishers are going to have to do some very deep thinking.

BAKER: What sort of responsibility do publishing houses now take to find literature in foreign languages suitable for the juvenile market? Does it exist, and how does it get translated for this country?

AYLESWORTH: There are myriad ways in which we find out about foreign books. To begin with, we do have offices in foreign countries, and part of their responsibility is to alert us to foreign books that we might be able to use. There are also many contacts made at foreign book fairs such as the Frankfurt Book Fair or the Bologna Book Fair. Many foreign publishers employ American agents to show their books in this country, and there are a few fine translators who are always on the lookout for books that they would like to translate. Foreign publishers make frequent trips to the United States both to buy and sell. We

also regularly receive the catalogs of foreign publishers.

BAKER: One of the recent trends in publishing has been the taking over of a publishing house by a conglomerate. Companies like this are into producing all sorts of materials, print and nonprint. Do you, in bringing books to the public, also make it a part of your responsibilities to be in contact with people in these corporations? Are the people in these companies making a change in the kinds of materials that get published in book form?

SMITH: Our effort has been the development of books and books alone, though we do have several divisions at McGraw-Hill such as text film and others, which do audiovisual work. From my standpoint, I have always wanted to develop a good, solid book, and if it is usable in other media, I was very happy. However, I did not orient myself in that direction when I look at a manuscript or talk to an author. I feel that some media products are developed that way very successfully, but I do not think much of it is generated in our editorial offices.

AYLESWORTH: We do have our own Doubleday divisions in the multimedia area, and, of course, they see everything that we produce. On the other hand, in order for these divisions to be well run, they must see the things from all other publishers, and ours get no preferential treatment at all. Actually, if one of our books turns out to be a filmstrip, we are delighted.

BAKER: Most people involved in buying science things do not buy just books any more; they are really looking for a unit approach. How much do you think about the possibility that a book might lead into another instructional medium?

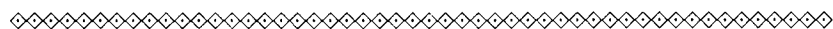
SMITH: At one time we were doing some trade books with an English publisher. I was very interested to see how differently he did books. He tended to put science on a pedestal. The reader was to read about famous, wonderful scientists and their good works. As I talked to the English publisher, I really came to the conclusion that we thought of our books very differently. We usually tell children to take certain materials and put them together. Or we tell them to make machines or to study animals and plants, or to find out what happens for themselves. In this way we feel that children do more than just read a book. They can work a successful project or experiment which helps them learn science from the inside out. This in turn, we feel, often leads them into the process of science so that they can understand it and progress to more advanced books. Although not all of our books follow this pattern, the English books were encouraging the reader to be a spectator.

*Juvenile Book Editor*

AYLESWORTH: I think that in some ways Doubleday is a different type of publisher from McGraw-Hill. Our prime sales areas are the library and the bookstore, so we seldom publish juvenile science books for the public school classroom. That is, very few of our books are purely instructional. We may have many books that are, in a sense, handbooks, such as how to raise various kinds of pets or do chemistry experiments, but we expect this to fall into the hands of the child who will use it in his hobby. On the other hand, when we are planning a book for general interest, we very seldom put in manipulative experiences. We feel that these books are to expand the child's horizons. So, in short, we seldom combine the two types of books. We seldom design a book in the hope that it may eventually turn into a film, a filmstrip, or any other type of nonprint medium. That comes under the heading of subsidiary rights, and we can always hope, but never plan.



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## Responsibilities of Reviewers

FRANCES DOUGHTY

ESSENTIAL to a discussion of the responsibilities of the reviewer of science materials for children is an understanding of recent developments and concepts in the fields of science, education, and criticism, involving the evaluation and selection of many materials. The problem is a complicated one; separate disciplines are concerned with the answers which, although often tentative, contribute to the background knowledge necessary for effective reviewing.

### PRESENT CONCEPTS IN EDUCATION AND SCIENCE

Open classrooms, alternative schools, and vouchers are a few of the ways in which educators are attempting to meet the challenge of educating today's youth. It is evident that in most cases the textbook-oriented formal classroom is inadequate to fill the needs of the present, given the acceleration of research and communications of the past decades. Some of today's concepts and concerns in education and science are found stated below.

Frymier summarizes "that the need to know (the need for stimulation) is man's only insatiable need . . . a pressing, relentless part of life itself."<sup>1</sup>

Bertrand Russell felt more than forty years ago that "power-knowledge would supersede the science which was once born of love of things and persons."<sup>2</sup> This is a prophecy whose time has come in view of the political and scientific developments with which we are constantly bombarded via the media.

In *The Golden Bowl* Henry James asked, "What was science but the absence of prejudice backed by the presence of money?"<sup>3</sup> Since James's day, "pure" science, married in the twentieth century to technology, has become prejudicial; but money is still vital to research and development.

George Sarton, a great scholar in the field of the history of science, pointed out that man's ability to find further knowledge, and to know

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Frances Doughty is Editor of *Appraisal: Children's Science Books*.

how and when best to use it, is far more important than his actual knowledge. Implicit in this idea is the value for which man uses his knowledge and how he discovers the knowledge he uses. These are important considerations for one attempting to evaluate science materials, since helping to build the discrimination of young people in finding and selecting pertinent information is a major task. "Our primary function as educators must be to recognize that to educate is to 'lead out.'"<sup>4</sup> The ways in which this function can be accomplished are diverse. No one way solves all educational problems, but today's emphasis on having children pose their questions and "discover" the answers is a step in the right direction.

Ralph Lapp, nuclear physicist wrote: "it is through brain power that we will solve the highly complex problems of the future . . . we also need the elixir of support for basic science. . . . Scientists must . . . develop the innovations which will interconnect this century with the next. Those future innovators are now in your schools."<sup>5</sup>

How can potential innovators be recognized and stimulated? Perhaps through individualized teaching, under "an umbrella structure that provides a format for trying out all kinds of different teaching methods, techniques, and strategies, with one idea in mind—giving each child the opportunity to learn with the materials most suited to him and in the situation most suitable to his style of learning."<sup>6</sup> This method is a challenge to the parent, teacher or librarian. It opens the door to providing the child with what he wants and needs. Often need and want do not synchronize; it is then that the persuasive skill of teacher, librarian, or parent is called upon.

#### USE OF MEDIA MATERIALS

The use of the word "materials" in addition to books on science for children greatly enlarges the scope of reviewing, evaluation and selection. Materials may be defined as "books, periodicals, pamphlets, and other publications as well as films, slides, recordings and other audiovisuals."<sup>7</sup> Media may be defined as "printed and audiovisual forms of communication and their accompanying technology."<sup>8</sup>

There has been a tremendous proliferation of media materials finding their way to the educational market where, if accepted, multiple orders for an item for a school system contribute to its publisher's success. Related to this is the development of media centers (which include the library) in schools. This trend is evident in recently constructed school buildings with their generous space for study carrels, stations, and areas which can be converted for use by small or

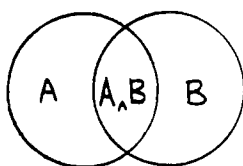


Fig. 1. Domains in School Media Specialization

Legend: A = Media—Knowledge, B = People—Users, and A ∩ B = Media—Knowledge and People—Users

Source: Baughman, James C. *School Media Quarterly*, 1:277, Summer 1973. Reproduced with permission.

large groups, with adequate room for housing hardware and software. In many school systems, however, libraries—if any—are under the direction of librarian, teacher-librarian, or volunteers; audiovisual equipment and materials are often acquired and dispensed as a separate unit. Such diversity increases the problems of efficient selection, acquisition, distribution and maintenance of available materials.

Figure 1 illustrates the domains involved in school media specialization.<sup>9</sup> Among media materials can be found filmstrips, cassettes, video tapes, films, recordings, tapes, slides, pictures, maps, sets of transparencies and overlays for the overhead projector, kits offering these in various combinations, games, puzzles, mineral and biological specimens, live plants and animals which, with books and pamphlets, are all used today in science education for young people. In other words, almost anything can prove useful, depending on the ingenuity of the eager child and adult. One has only to scan any issue of *Science and Children* or *The Science Teacher* to become aware of the multiplicity of materials.

Although available materials are abundant, in many places the standards recommended by the American Library Association and the National Education Association for school media programs are still only goals for a distant future. Recent cutbacks in federal funds, inflation, diminishing school enrollments and local budget cuts are deterrents. Peggy Sullivan finds that “the media program . . . has a special role to play in the continuing education of teachers. . . . In addition, the nourishment and growth of the media program itself requires action and competence from other members of the staff.”<sup>10</sup> If there is no real interest in the program, it will founder. One way to

involve staff is to make use of individual talents or knowledge for the enrichment of all. The *Standards for School Media Programs* states that "evaluation of materials in the media collections is a continuous process . . . Suitability for the users of the media center is a major criterion, but such established elements of evaluation as accuracy, values, up-to-dateness, and style are also considered."<sup>11</sup>

Unfortunately, many reviews of media materials are mere summaries of products and offer little help to the viewer or listener who may be the purchaser. Certainly it is a function of a reviewer to make judgments according to the usual critical standards. It is not enough to review *only* those few items which are of top quality; educators are constantly exposed to the "hard sell" in what has become a highly competitive business. Appraisal of as many materials as possible is needed. Catalogs are not selective; opportunity and time for previewing media are often nonexistent. "Selection is at best a difficult job with so many background factors to consider in relation to the large quantity of materials available, together with the reality of limited amounts of money for the purchase of materials."<sup>12</sup>

In an excellent article on filmstrips, Diana Spirt says: "Criteria by which we evaluate and choose . . . are only as sound as the judgments of the people who use them. There are really only two main . . . criteria for selection of media . . . (1) What is the idea, intellectual content, etc. in the material and how is it presented?; (2) Is the medium that is used to present the idea the most suitable for its treatment?"<sup>13</sup> To these criteria must be added another—one encompassing the canons of good taste and merit.

More than thirty-five periodicals are now reviewing recordings; there are several newcomers to be noted in the media field, particularly *News and Previews*, at this time a yearling of the *Library Journal*, and *Media Review*<sup>14</sup> which was initiated in January 1973 to complement the *Bulletin of the Center for Children's Books*. Also useful as a selection tool is *A Multimedia Approach to Children's Literature*.<sup>15</sup> The selection is based on firsthand evaluation and use with children. Although no science headings were listed in the index and no entries on science were included in the text, the three introductory sections are excellent for general information on selection aids for a broad range of audiovisual materials.

#### CHILDREN'S READING

In general, children are reading less than they did twenty-five years ago. Malcolm Douglass analyzes the problems of learning—motor

### *Responsibilities of Reviewers*

responses and cognitive behavior in particular—with which child psychologists such as Jean Piaget and Jerome Bruner have long been involved: “There are four major elements interacting as any reading proceeds. . . . The first . . . is the environment of the reader . . . the second . . . is that process by which the human organism changes visual, auditory, and other forms of stimulation into neural responses . . . . Two elements . . . remain; they are those of perception and of responding [which are mysteries] at once the most complex and at the same time those we know least about.”<sup>16</sup>

Other factors in learning to read are:

1. Maturity. All children go through much the same stages of physical and mental development. However, they mature at their own rates along different paths and sometimes in quantum leaps.

2. Interests. It has been found that certain interests of children appear at certain stages of their growth and can make a decided impact on what knowledge a child acquires. When he is immersed in a subject—dinosaurs, horses, astronauts—difficulties with vocabulary fade away and understanding increases due to his intense desire to “find out.”

3. Innate ability. There is no denying the fact that, unless a child has a specific reading disability, the verbal-minded child will, other things being equal, cope with reading materials better than the nonverbal child.

#### REVIEWING CHILDREN'S SCIENCE BOOKS

When one contemplates the reviewing, evaluation, and selection of children's science books one is on firmer ground in theorizing about children's reading for, on the whole, these criteria are closely allied to those applied to adult criticism, limited by the young reader's maturity, reading level, etc. These limitations are well stated by Harry Stubbs in discussing the writing of young children's science books:

The problems of writing science books for the very young may not differ greatly in kind from those of other forms of scientific writing, but they certainly differ in degree. The always important distinctions among reasonably certain observed fact, highly probable theory, and very uncertain hypothesis must be kept even more firmly in mind by the writer or the illustrator whose intended audience has barely learned to read. These are the distinctions which young children are least able to recognize for themselves.<sup>17</sup>

Another problem which reviewers, reading and cogitating in their ivory towers, seem to overlook on occasion is whether the book will appeal enough to youngsters to be read by them. What good will it do to pass judgment on the accuracy, etc., of a science book if it is dull, inexpressive, and unattractive? The book with flair, written from knowledge of what appeals to a child, has a greater chance of connecting with the young reader than a dull, condescending recitation, no matter how factual. Günter Ebert writes: "We are all familiar with the old dilemma in our work: children's books are written by adults, propagated by adults, and criticized by adults. The only thing children have to do with the books is to read them. . . . Young readers do not always articulate their wishes, but they react inevitably and very clearly to the lack of excitement in their books."<sup>18</sup>

Criteria are available to use when reviewing science books for children.<sup>19</sup> Accuracy is important, although its extent or quality varies with the age of the young reader. Oversimplification is a danger; some theories cannot be proved and should be presented in the light of modern research as still unanswered questions. Concepts should not be confused with facts. Anthropomorphism, teleology, and animism should be avoided. Clarity and logic in presentation of material is important. The style should be fluent. Illustrations, whether diagrams, sketches, paintings, or photographs, should illuminate the text and be positioned on the page and captioned so as to aid the reader's understanding. Books without indexes are less useful as sources of information.

Since we know very little about how and at what age children can identify with adults making significant contributions—e.g., Isaac Newton and the law of gravitation—writers of juvenile biographies should be particularly careful to present a true picture. Some accounts seem to be merely watered-down versions of adult biographies, with dubious aspects of the subject's life glossed over or omitted, and give a false impression to the young reader.

Also important is recognition by the author of the fact that science is not always made up of successes. Many hypotheses fail, and many experiments lead to failure. Children, in addition, should be shown that the achievement of an individual often depends on earlier work by others.

Science fiction is an area generally overlooked by the reviewer of books on science per se. Reviewing science fiction is usually the occasion for hot debate among reviewers who may cry, "This is fiction! How can we review it as science?" or, "But it uses and explains

### *Responsibilities of Reviewers*

topography," or "tells about ESP. We should review it because children will read it." Another aspect of science fiction we cannot discount is its "presentation of man's need to change his own nature."<sup>20</sup>

A final criterion to be relied upon is the reviewer's own, possibly subliminal, reaction. This is difficult to define, for reviewing is a highly subjective matter, depending on the experience and insights into children and books which the reviewer possesses. "In the long run, only continued intelligent reading and concern for the reactions of young readers can begin to resolve some of these selection problems."<sup>21</sup>

#### A DUAL APPROACH TO REVIEWING

"Give me anything but science books! I am not qualified to judge them," was the oft-repeated plaint of a group of children's librarians during book review meetings of the Massachusetts Division of Library Extension early in the 1960s. As a result, the Children's Science Book Review Committee was formed.<sup>22</sup> In September 1963, with the New England Round Table of Children's Librarians as sponsor, an experimental project was set up with the Boston Museum of Science which invited specialists working in scientific or technical areas to judge books for scientific accuracy, up-to-dateness, etc., with librarians reviewing the same titles for style, format, reading levels, and appeal. In this way a more meaningful appraisal of a book would be offered as an aid to librarians, teachers, and parents searching for books for children from preschool through ninth grade.

Since 1964, the Graduate School of Education, Harvard University, has sponsored the work of the committee by providing office room and the services of a part-time secretary, without which the volunteer assistance of librarians, specialists, and publishers might not have survived.

After several years of experimenting, it was decided to publish *Appraisal: Children's Science Books*<sup>23</sup> three times during the academic year. Each issue contains a lead article and two reviews for each title for which suggested age levels and an over-all rating are given as a ready reference. All reviews are initialed, and a list of contributors is included. Only books with reviews from both a librarian and a specialist are covered in *Appraisal*.

A cumulative author-title index appears annually in the fall issue. A recent, but at this time sporadic, inclusion is "Media Materials," limited to those associated with children's science books. It has been well received, but practical difficulties have still to be resolved.



Librarians within easy access of Cambridge, Massachusetts, attend bimonthly meetings to see, discuss and select books. Specialists in education, science, government agencies, etc., range geographically from Maine to Oregon, from Minnesota to the District of Columbia. Although in most cases both reviewers come to the same conclusions, it is by no means uncommon to find the two opinions diametrically opposed. If so, it is an indication to the reader to take the trouble to look at the book and make up his own mind.

The publication committee which prepares annotations of reviews for publication is intrigued by the fact that often the librarian takes on the role of the specialist who may then comment on style, readability, etc. Each learns from the other.

Now in its seventh year, *Appraisal* is well established, and has received excellent notices. Throughout Canada, Europe, and the United States as well as in Australia, Asia, and the Middle East, it has proved itself to be, with its dual approach, a valuable selection tool.

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## AAAS Science Books: A Selection Tool

KATHRYN WOLFF

FOR AT LEAST two decades, the American Association for the Advancement of Science (AAAS) has had an active program intended to improve children's understanding of the products and the processes of science. The association's programs to promote "science literacy" have included development of a science curriculum for the elementary grades (*Science: A Process Approach*, K-6), sponsorship of traveling science libraries, preparation of annotated bibliographies of science books for children and young adults, and the publication of the science book review journal, *AAAS Science Books*.

The association's interest in the development of science literacy in all segments of the population and in all age groups is a necessary consequence of the three objectives for which it was formed. These are (1) to further the work of science, (2) to facilitate the use of science to promote human welfare, and (3) to increase the public understanding of the uses of science for human welfare. Unlike the individual professional societies (approximately 300 of which are affiliated with AAAS), the association is a multidisciplinary society concerned with interdisciplinary communication and with promoting communication between scientists and laymen on all aspects of the sciences.

The association (and its 135,000 individual members) has an interest in making science information widely available because the public's understanding of science has a considerable impact on how effectively work in the sciences can be carried out. Further, in order to use the sciences to promote human welfare—that "welfare" being defined by the people affected—there must be substantial public understanding of possible uses of science and of potential difficulties. Science literacy—for this discussion at least—implies a minimum necessary understanding of the sciences.

Just how a reasonable degree of science literacy can be developed in either adults or children has been matter of considerable dispute during the past quarter century. To date, there is no evidence that

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significant numbers of adult laymen either have been or can be influenced to increase their understanding of science to any measurable extent. Children, however, especially those in grades 1 through 8, are apparently open to and eager to acquire science information.<sup>1</sup> It is this group which the AAAS has been making a special attempt to reach.

From 1955 to 1964, the association administered the traveling science libraries which went to hundreds of schools so that there would be science materials other than textbooks available to as many students as possible. The need for the service was substantiated by surveys: there was an average of only 5-6 percent science or science-related books in the recipient schools' permanent library collections. But, even though traveling libraries appeared to be excellent "starters" for building interest in science, the association's main thrust was toward improvement of permanent science collections in school and public libraries for both children and their parents and teachers.

To help those responsible for science book selection, the AAAS published book lists.<sup>2</sup> These annotated bibliographies (the most recent of which was published in 1972) covered separately books for children and for young adults. Each bibliography was a major undertaking and listed books from all science areas. Since it proved impractical to keep these book lists current, in 1965 the AAAS established an additional selection tool, the review magazine, *Science Books: A Quarterly Review*.

Now in its ninth year of publication, and with a new name, *AAAS Science Books* is received by about 6,000 libraries and school systems. In the magazine, current books are assigned ratings (highly recommended, recommended, acceptable, or not recommended) and grade level estimates (three divisions for the elementary school, one each for junior and senior high school, one for lower division college, and one for those professional level books which reviewers feel are suitable for reference or review for science teachers). Reviewers provide a 100-300 word summary-critique of each book, and are asked to comment specifically on the accuracy of the information, the scope of the work, the clarity of the writing and the value of the book when compared with other similar titles. The reviewers' comments (or summaries of their comments), complete citations and often some additional information supplied by the staff are published for about 900 science books each year. These 900 books (roughly half for readers in grades K through 10) are selected from some 2,000 science books received annually, and are reviewed by 650 volunteers, all of whom are either scientists or science librarians.

At the time *Science Books* was established, science and scientists were highly regarded, and the highly visible achievements of the sciences made science studies and science book purchases attractive. Many book publishers responded to this favorable climate with a flood of books for young people on a multitude of science topics. Some were very careful and employed competent consultants familiar with each particular field. Other publishers, even some of the biggest, seemed more interested in return on investment than in accuracy or intellectual quality. The problem of selection was real, and the AAAS acted to "provide those who buy books for school and general library use with critical and reliable judgments concerning quality, content, and appropriate age level of the new books shortly after they appear."<sup>3</sup> Most reviewed books were at least "acceptable," but some "not recommended" books were included with appropriate explanations to further the goal of promoting excellence in children's science books.

To judge the credibility of a book review journal and its usefulness as a selection tool, one must know (1) the purposes of the organization which provides it, (2) the nominal standards, (3) the ability and willingness of the reviewers to conform to these standards and (4) the adequacy of the standards for making appropriate selections for a particular audience.

The reasons for the AAAS's interest in promoting science literacy have already been set forth. Initial criteria for review were developed by Hilary Deason, who was in 1965 the director of the AAAS Library Program and the first editor of *Science Books*. The criteria which he established (and explained in an article in *Science and Children*) were:

*Authorship*—Does the author have the scientific qualifications to write a book on a particular subject?

*Subject and Content*—Is the subject of fundamental interest and importance to the prospective reader? Is it handled in sufficient depth so that it will constitute a worthwhile learning experience? Is the organization logical? (If the book answers the fundamental questions of "how" and "why" using appropriate technical terms, it is probably worthwhile; if it is a superficial survey covering too broad a scope, perhaps it should be avoided.)

*Illustrations*—Are the photographs and drawings accurate and are they accompanied by adequate explanatory legends keyed directly to the text? Mere embellishments that add nothing to the text are seldom worthwhile.

*Vocabulary*—Most young children can and should read any words

that are the best choice for expressing scientific ideas and concepts. "Controlled vocabularies" are totally unnecessary. With pronunciation markings and definitions either in the text or in a glossary, a reader of any age can understand and learn to use correct technical terms.

*Biographies*—Science biographies for children and young people should be written as contributions to the history of science and stress the biographee's discoveries, contributions, and professional attainments and associations. A fictionalized biography that relies heavily on manufactured conversation and relates nonessential personal details may be interesting reading, but it has no value in science education.

*Nature Study Versus Science*—Animal tales and folklore have their place, particularly for preschoolers. In school, children deserve more substantial fare—no talking animals, no anthropomorphisms, no "Dick-and-Jane" reading matter. Material taught in terms of biological science (Who? How? Why?) is interesting and enables students to "get involved." Genuine biology books are preferable to superficially descriptive and sentimentally written "nature books." Look for books that give complete life histories or ecological studies.

*Physical Science and Technology*—Merely descriptive books about rockets, missiles, airplanes, atomic reactors will entertain but are not educationally worthwhile unless they introduce the reader to fundamental scientific laws and principles—and to the painstaking underlying research and experimentation. Such books should demonstrate to the reader how and why his science and mathematics courses are basic preparation for those who want to be scientists, technologists, doctors, engineers, and space travelers.

*Experiment Books*—"Experiment books" designed to demonstrate scientific facts and principles should encourage the reader to do additional experimentation on his own initiative and should stress the value of additional background reading.

*Reaching Upward and Outward*—Buy books for children and young people that they will have to "grow into"—books that hold their interest but that require repeated reading and study to understand and enjoy thoroughly. Books should be chosen not only to deepen the reader's major fields of interest, but also to acquaint him with other, unfamiliar areas of knowledge.<sup>4</sup>

Books which met all or most of these criteria were to be rated "highly recommended" or "recommended" in *Science Books*; those which were

somewhat deficient in one or more characteristics but which did not contain any serious errors were rated "acceptable," while books with serious errors or deficiencies were listed as "not recommended." In defining science, it should be noted that, while primary emphasis was placed upon mathematics and the physical and biological sciences, other areas were also included: applications in medicine; engineering sciences and technology; and some areas of the behavioral sciences, especially psychology, sociology and cultural anthropology.

The watchword was *rigor*, and the above criteria meant that sentimental, anthropomorphic, merely descriptive, or overly simplified presentations were not considered to be science. These selection standards were developed at the same time that major nationwide changes were occurring in science curricula. The scientists and educators involved in preparing new curricula for science courses for elementary and secondary students were also emphasizing rigorous presentation of science information. These curriculum developers were quite influential, and their science presentations emphasized the logic, intellectual achievements and the spirit of adventure and discovery which motivated the scientists themselves. It was expected that the same courses which would interest and prepare a scientist-to-be would prepare a future citizen to "appreciate" science and to be scientifically literate.

The basic assumption underlying these new science curricula was that the study of science provided its own motivation. That was also a fundamental assumption in *Science Books* criteria. Thus the quality standards for *Science Books* were compatible both with those of the science curricula and with the expectations of most university-based scientists, many of whom were *Science Books* reviewers. But, while there was unity of purpose among members of the scientific community, one must still question whether the *Science Books* review process was completely adequate for making appropriate selections for an audience of children, young adults and adults, most of whom were not and would never be scientists.

Of late, educators and many scientists have begun to realize that no single science curriculum will reach all students, and that the rigorous new science curricula turned off more students than they attracted. It seems reasonable to suppose that *books* selected primarily for accuracy or for "science for the sake of science" will also fail to attract substantial numbers of today's young people. Just as some curriculum groups are now working on more "relevant" science courses, so we at *Science Books* are also considering additional standards for selecting science books for young people.



These new standards must be concerned with both a book's relevance and its motivational material, especially since the climate of opinion about science has changed considerably in the past decade. Eight years ago, more than half of the public accepted science as a beneficent factor, but eighteen months ago that figure had dropped to one-third.<sup>5</sup> In this poll, adults were questioned, but young people are surely influenced by the climate of opinion around them. Further, many young people seem not to be seeking a rational understanding of the world; there is a resurgence of interest in mysticism, astrology, and the occult. These may be only passing fads, but the basic problem remains: if we cannot find some way of getting most young people interested in the sciences as a means of understanding themselves and the real world, then this civilization is in considerable trouble.

Science, through its discoveries, and especially through its conceptual processes, has become a major intellectual and economic force. While the theories and concepts of science may never have great aesthetic appeal for most people, all responsible citizens must have some real understanding of science processes and potential science applications because, through design or through incomplete understanding, science and technology can be directed to some very destructive purposes. While some may argue that we can solve such problems by decreeing "no more science," most thoughtful people agree that our technologically based culture has progressed too far for that. More science, not less, more scientists, not fewer, are needed to solve the technical problems we already have and to prevent much more serious problems from developing. Some young people must become scientists, but all young people should have an understanding of science.

In the schools, science must become an integral—and integrated—part of all studies. And we must somehow discover and put in the libraries the kinds of science books which young people will read willingly. I do not mean to suggest that we no longer need to be concerned with accuracy, logic, good design, and all the other selection criteria previously listed. Indeed, we need to be particularly careful of accuracy of both fact and implication in all science books—including those for the beginning reader—which undertake to show children the interactions of science and society. Errors learned early are hard to correct later, and most children have only about ten years in which to acquire basic science information. When we consider that the voting age is now eighteen and that most children do not really begin to read with any facility until they are seven or eight, we have to view the

selection of good science books *which children will read* as a matter of some urgency.

Unfortunately, social relevance does not guarantee reader interest any more than does scientific accuracy. Motivational material is needed, but what kind and how much is difficult to judge adequately. Any competent scientist can say whether or not a book in his own field is accurate and not so overly simplified as to be misleading. But what will appeal to the student not already interested? Here we move into an area of art and a maze of individual abilities and preferences. We do not yet know enough about individualization of instruction to do it effectively; but we do know that we need quite a variety of different materials to satisfy different student needs. Similarly, if diverse individual needs are to be satisfied by libraries, science collections are going to have to expand considerably, and books offering many different approaches to the same science areas will have to be provided. This means that additional demands will be put on already limited library resources. It also means that more stringent requirements for book recommendation must be set by selection tools such as *Science Books*.

What in particular should we look for in judging young people's science books? First, we can certainly look for science books in which the writing is lively and not too difficult. Second, we can look for a personalized approach. At a minimum, characters and situations should be portrayed so that a variety of readers can identify with both. Pictures are especially important; they should have the clarity and impact of a good news photograph, and they should give the reader a feeling of personal involvement in the science process in as many ways as possible. This includes such now obvious factors as showing representatives of various races and both sexes participating in the activities illustrated.

Books must be lively, but they must also avoid the "gee-whiz" type of presentation which tends to promote a mystic attitude toward science-as-magic rather than science as human investigation of natural events and forces which have explanations understandable by the reader. After reading a good science book, children should have the feeling that their world has become more predictable. Thus, as they gain knowledge, they also gain self-confidence and pleasure in their developing sense of personal competency.

Many science books would be more interesting if they included more about the historical or social setting and if the author displayed some sympathy for the "ignorant" who may have opposed the use of a

particular science discovery or failed to understand the significance of some newly developed concept. (After all, we also are ignorant of tomorrow's discoveries, and displaying the need for humility is not amiss.) Authors must, in addition, make a real effort to reach out to the readers who may already be frightened or alienated by a scientific culture which seems about to engulf them.

We need to look for presentations which are not so imprecise that readers will misunderstand the implications of scientific concepts. But, for younger children especially, we should realize that some abstract concepts probably *cannot* be explained properly. When reference is made to aspects of science which cannot be adequately explained, readers can be told the minimum necessary and told to look the matter up elsewhere if they wish. Every writer should also be very faithful in pointing out that no field of science is known completely and in most fields our knowledge is still scant. The scientific elitism which has plagued many science books in the past should be avoided at all costs.

Two other aspects of science development and discovery are interesting, important and often insufficiently emphasized in many science books. They can make science a more approachable subject for many readers and should, therefore, be on our list of qualities which contribute to a good science book. The first concerns the nature of the scientific method, and the second is the part intuition plays in many—if not most—important science insights and discoveries.

The scientific method, it should be emphasized, is not some esoteric process known only to its devotees. It is rather the analytic process we all use when we are solving problems logically. We gather data, we try to see if other people see the same things which we have seen, we sort our information into what we are reasonably sure of and what is less likely, we try to make the best guess we can about what the data mean, and then we look for further evidence to see if our guess is right. This *is* the scientific method, it is a natural human mode of operation, it is carried out more or less well by everyone, and it is just as useful in discovering the truth behind television commercials as it is in discovering the truth behind quasar signals.

In addition, analytical thinking is withholding judgment until enough data is in. Often science books—even those by scientists who should know better—skip the doubts, the wrong turns, and the incorrect guesses which went into developing some science theory. Also, they may not give the reader any real basis for understanding what constituted enough data in a particular situation. (What is “enough data”? There is no absolute answer, but certainly we need to

look for books which show young readers the tentative nature of many scientific hypotheses.)

The other aspect of science which should be emphasized is the value of intuition. For those used to the usual analytical mode of science reports, the importance of intuition in science may come as a surprise. It should not. Intuitive thinking is a natural and apparently necessary—if little understood—antecedent of scientific discoveries. Do new ideas come as a result of consciously unresolvable conflicts in observations which are then unconsciously recombined in new ways, leading to new insights? We do not know, but we do observe that creativity is often a product of aloneness, of apparent inactivity in an individual who is both knowledgeable and open to new, even outrageous, notions.

Science books which point out the fact that advances have been made in all fields of science by people who did not automatically reject wild notions ought to interest young readers who are themselves trying to break out of what they see as the undue restraints of society. (Let me enter a disclaimer at once lest anyone suppose that I am either fomenting revolution or proposing that young people be encouraged to believe in wind gods which blow out of the west or invisible ropes which hold the moon to the earth. I am only suggesting that we need to look for books which counter an overly analytical presentation of science and the scientific method.)

We need, then, additional criteria for selecting good science books for children, but not a replacement of those criteria which reviewers have used and are using when they write their reviews for *Science Books*. We need to select books which include motivational materials, lively writing, good photographs and drawings, analogies, parables, stories, and even humor. All have a legitimate place in science books, provided they add to the reader's comprehension of the science facts or processes under discussion and that they are clearly labeled so that young readers will understand what is going on.

The push toward rigorous science presentations was especially important at a time when we were taking first steps to insure accuracy in teaching science principles to all students. Now we must go one step further and integrate science into the fabric of living. Criteria for judging science books must include standards directed to this end. It appears that some of the *Science Books* reviewers are already moving in this direction. They are basing their judgments on an expanded set of criteria which include but go beyond the 1965 criteria. The next step is to develop these ideas into tentative guidelines which will then be

circulated to all *Science Books* reviewers for their comments, suggestions and corrections. This procedure should produce a very strong set of guidelines and the selection process should improve as a result.

Some very vigorous comments and some considerable disagreement among some of our contributors may be forthcoming. There may also be new insights into book selection for young people who, in the early grades at least, are curious, alert, and concerned about sorting out the contradictory information that hits them from all sides. This interchange with reviewers will mean that *Science Books* will be an even better selection tool, helping to provide an information base so that "every citizen, every man in the street . . . [can] learn what science truly is and what risks and quandaries, as well as what magnificent gifts, the powers that grow out of scientific discovery engender."<sup>6</sup>

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## Selecting and Evaluating Science Materials for Children at the Elementary Level

KATHRYN S. HOWIE

THE SCIENCE COLLECTION in a library, if it is broad, wide and deep enough, is where the action is. Children are curious. They find science exciting; their interests may range from apes to butterflies, feathers to radioactivity, chlorophyll to birds, cryogenics to space medicine. And with each succeeding generation children not only become more sophisticated in their interests, but they become less print-oriented. This presents a real challenge to authors, publishers, teachers, librarians and reviewers.

Science books for children cover an amazing variety of subject matter from a simple concept in a book such as *Round is a Pancake* by Sullivan to the complexities of relativity. How do those responsible for selecting for an elementary school collection choose? What are the guidelines? The first consideration in selecting science books for children must be the children themselves. A child's interest, reading ability and background of experience should be the guidelines. Above all, the selector must care about children and know a great deal about books.

It is essential that science books be written from the child's point of view, and most authors know this. Children are quick to recognize the patronizing tone. The Branleys, the McClungs, the Podendorfs, Selsams, Bendicks and the Milgroms seem to have a keen knowledge of the child's mind and thought processes. Such writers do not offend the child's dignity and sensitivity by offering him pablum.

Clarity and good organization are of primary importance. *Grasslands Around the World* by Naden is a good example of a book which presents material in a logical, step-by-step, neat and clean fashion. Good organization also means a table of contents and a well-developed index.

The reviewer looks for accuracy in judging a science book. A scientifically incorrect book that confuses and misinforms the reader

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should be eliminated immediately, regardless of need, low cost or currency. Any such books in an existing collection should be discarded, not given away; deprived children should not be the recipients of inaccurate, outdated or shabby books.

Knowledge of an author's credentials is helpful in selecting books, although some authors with the "proper" background are not always able to present their materials at a child's level. Science writers with the magic formula are the ones to lean on and feel comfortable about buying their books. Even so there is an occasional letdown; books should be considered individually.

Everyone selecting children's science books knows that the date of copyright is especially important, unless the book has a timeless quality such as *The New Golden Treasury of Natural History* or *The Fossil Book*. Librarians must be aware that changes in teaching methods should be reflected in selection. Fortunately, the publishers are right on top of this, and may actually be changing teaching methods. New methods include such devices as the discovery method, or open-ended books which lead the reader to discover for himself. *Odds and Evens* by O'Brien or *Estimation* by Linn are examples of the open-ended approach, as is *Science Projects that Make Sense* by Stone, in which the experiments lead young readers to find out for themselves.

However, the discovery method is not for every child. Some children are completely at a loss with open-endedness, because they are timid, insecure, apathetic, or conditioned to wait to be told what to do and how to do it. It is important then, to have both kinds of books in the collection. *A Children's Book of Simple Science Experiments* by Pacilio is an example of a book that leads each step of the way, but it also allows a reader to think.

Another important criteria of the experiments described is safety. Frequently children perform science experiments as independent projects in school or at home. Perhaps it is being overly cautious not to recommend a book which includes an experiment that suggests the use of matches, a Bunsen burner, or plastic bags, even though the author stresses safety precautions, but one can never be sure that every child will read them in the excitement of carrying out an experiment, or, if he does, one cannot be sure that he will follow them. I fear for the one child who might come to harm.

One must be alert to stereotyped science books, either in text or illustrations, as much as to fiction or picturebooks. There is evidence that authors and publishers are breaking away from the mold, but the market still has few books showing women in laboratories or Black

scientists. Although the illustrations in today's books may show a variety of ethnic backgrounds, there is still some tokenism, e.g. of ten science experiment books surveyed at random, seven were addressed to boys. Ours is a rapidly changing society and children are deeply affected by it. Any group will question books that leaves them out.

Is the coverage of the book adequate? In *The True Book of Spiders*, Podendorf answered most of the questions a primary child would ask. In an easy-to-comprehend text, it tells where spiders live, what they eat, how they move from place to place, how they protect themselves, and how they are helpful and harmful to humans. Rosen wrote *Spiders are Spinners* in charming rhyme, and although scientifically accurate as far as it goes, it is much less appealing to children who like their facts straight.

Carrick dedicated *Swamp Spring* "to the conservationists who hold back the day when swamps exist only in books"<sup>1</sup> and related it closely to the social problems of today, a criterion not to be overlooked. Children are very interested in the land, and conservation is one of their big concerns. *Beaver Pond* is a stunning picture book which vividly described the chain of ecological events that result from the damming of a stream. It is both an explanation of ecological balance and the story of an animal's life chain. *The Dead Tree* is another impressive picture book by Tresselt which deals with the life cycle of a tree and the interdependence of the birds and animals that live in it and around it. In *The Mountain*, Parnall, with the briefest of texts, graphically illustrates the ways man is devastating the land.

Science books are generally reviewed more for their content than for their literary value, yet the style and quality of writing is just as important in a science book as it is in any other kind of children's book. Some years ago, when my school district was assembling a collection of manuscripts, letters, and original drawings and paintings for children's books, Garrett Griffin wrote, "Good literature for children is a rare thing and the shame of it is that it is so important. Authors tend to write down to children. They spare vocabulary when a child is pleased and flattered to hear words he doesn't know. They produce banal books instead of leaving us a heritage for our children. . . . Well, fortunately there are classics in each generation."<sup>2</sup> These classics would include *The Pine Tree*, *The Big Snow*, *Houses from the Sea*, *The travels of Monarch X*, *The Gull's Way*, *All Around You*, and *Birth an Island*.

The format of a book can make it or break it. Primary children turn away from the printed page if the type is too small, if there is too much print or if it is too complex. On the other hand, students in the



intermediate grades will scorn a book if its print size or style of illustration look like elementary fare. This is both the publisher's and the librarian's dilemma. The plaintive cry of librarians, if they work in a secondary, middle or elementary school, is "How can I tell? Reviewers seldom let me know whether the size of the print or the illustrations are suitable for a particular level." Fortunate librarians can swap books with another level.

As a reviewer, I am interested in good quality paper and comfortable margins. I make sure that the illustrations clarify and extend the text. I note whether size relationships are made clear, as in McClung's *Aquatic Insects and How They Live* or Webster's *Track Watching*. If the text is printed on colored paper I deliberate over whether a child can read it with ease.

For all levels librarians are faced with the enormous problem of readability. Is the book written within the comprehension of the age for which it is intended? Vocabulary, sentence length and attention span of the reader are all factors to be considered. School librarians would do well to examine the school's basal readers for vocabulary guidance. Some authors work from a basic word list which requires considerable gnashing of teeth and talent on the part of the writer, as Dr. Seuss was to discover when he wrote *The Cat in the Hat* using only 223 words. He survived to tell about his experience in an amusing article, "How to Write a Book for Beginning Readers":

In writing for kids of the middle first grade, the writer gets his first ghastly shock when he learns about a diabolical little thing known as "The List." School book publishing houses all have little lists. Lists of words that kids can be expected to read, at various stages in their progress through the elementary grades.

How they compile these lists is a mystery to me. But somehow or other . . . with divining rods or something . . . they've figured out the number of words that a teacher can ram into the average child's noodle. (Also the approximate dates on which these rammings take place.)<sup>3</sup>

Perhaps storybooks can be written from a word list, but I wonder if all the things a child wants to know about—cells, atoms, ultrasonics—can be? Books like *Good Morning, Mr. Sun*, *Sounds All About*, and *Light and Dark* are a few examples of successful controlled vocabulary books. (Whether the authors used a list, however, I cannot say.) Happily, there are more and more meaningful science books being published for the primary readers. Youngsters no longer have to depend upon the textbook which, quite often, is too

difficult. A good collection of science books for all levels can more than extend the classroom; it might even replace the textbook.

Fry's "Graph for Estimating Readability" is a quick and easy way to check the reading level of a book (excluding math books which deal wholly with numbers, some science experiment books, poetry, and audiovisual materials). With the fifth edition supplement, *The Elementary School Library Collection* began to provide a closer estimate of the reading difficulty of individual books, based upon the Fry graph. Although this ambitious project is by no means completed, of the approximately 1,130 book titles in the science area (eighth edition), about 40 percent of the titles indicate a readability level.

It is not recommended that the reading level of every library book be determined. This would be an appalling task. It is recommended, however, that every librarian be familiar with the process, thus making it possible to come up with the readability answer should teachers or parents request, as they often do, a book at a particular grade level.

When you know that an elementary school reader is selecting books which are too difficult for him, you might show him how to apply Veatch's "rule of thumb" method which is rather fun and nonthreatening—"Choose a middle page with a lot of words. Read silently. If you come to a word you don't know, put down your thumb. If you find another, put down your first finger, etc. If you use up all your fingers, the book is too hard, so put it back and try another."<sup>4</sup>

But if the child still wants a book that is too difficult, let the child have the book he wants. Too often I have heard teachers, librarians and parents say, "No, Johnny. It's too hard for you. You can't have it." What a way to discourage kids! Sometimes a child wants the same book his peers have chosen, for status. Or he wants the book because it is pretty, or the pictures fascinate him. Most children cannot read the Life Nature Library, but they are willing to try. The pictures are indeed fascinating, and I would wager that few adults read them in their entirety, yet they enjoy looking at the pictures. I think that these kinds of books expand the child's vocabulary and widen his horizons.

Having patiently reviewed the criteria that a librarian considers, or should consider when selecting science books, are librarians going to disregard it all because the curriculum is the only consideration? Will librarians still accept *anything* if it meets a need? I hope they will reconsider what they owe their patrons.

Science books can be both a jumping off place and a jumping in place. Children who are interested in science can be led easily into a biography of a scientist—Audubon, Carver, Curie, Drew, Faraday or

Fermi, to name a few. Or into poetry. Try Fisher's *Going Barefoot*, which is the lilting story of a boy's joy in going barefoot and his observations of the animal world, or the gay verses about the world of crickets, chipmunks, turtle doves and dandelions, in her *Cricket in a Thicket*. On the other hand, readers of fiction books such as *Everything Happens to Stuey*, *The Space Ship under the Apple Tree*, or *The Enormous Egg* may be motivated to jump into some of the science books.

Caney's *Toy Book*, originally placed in the professional collection, has been located and read by our children. Although directed to adults, it is great fun for kids who learn many scientific principles as they work along with the author who can think the child's thought and talk his talk.

Since science periodicals and audiovisual materials are discussed elsewhere in this issue it would seem repetitive to go into any great detail. Magazines are a vital part of any library collection. *Alaska*, *Animal Life*, *Arizona Highways*, *Audubon Magazine*, *National Wildlife*, *Natural History*, *National Geographic Magazine*, *School Bulletin*, *Ranger Rick's Nature Magazine* and *Zoonooz* continue to be useful and popular and are recommended.

Audiovisual materials intended to enrich and support the curriculum should meet many of the same criteria applicable to books. Authentic, current and well-organized materials which are suitable for the range of listening and viewing abilities of the student are desirable. In addition, the technical production should be examined. Look at the artwork quality, photo quality, composition, audio quality, vocal quality and ease of coordination. Is the material economically feasible?

Unfortunately, some producers are unclear about copyright dates. The unwary buyer can get stuck with out-of-date or ancient materials that have been dressed up in a new multimedia package. Even worse, so-called "sets" sometimes include such a variety of subjects that not even Dewey himself could cope.

Being forced to purchase a whole set of sound filmstrips simply because four of them go with one record, or because two filmstrips go with the flip side of the record (which you do not want) is maddening. However, producers are now beginning to offer the consumer some options. It is possible today to purchase a sound filmstrip either as an individual unit or as a set. All in all, it would seem that producers are getting things in hand, making every effort to meet current needs. They *do* listen to their customers.

The ideal situation is for the buyer actually to see the materials in which he is interested. How else can he apply the criteria? Although

### *Science Materials at the Elementary Level*

guidelines are known for evaluating and selecting science materials, not everyone is fortunate enough to see the materials firsthand. There are some librarians who have to select from a state-prepared list (a deplorable practice), while others are locked into a central processing system which is inclined to order multicopies of an item, whether it meets a particular library's needs or not.

Librarians are, then, dependent on reviews, such as those found in *School Library Journal*, *The Horn Book Magazine*, *Booklist*, *Science Books*, or *Appraisal*. All of them are recommended selection sources. Some are more critical than others. Some have a noticeable time lag, but, on the whole, they are useful tools and we cannot do without them. Reviews of audiovisual materials may be found in a growing number of sources. *The Booklist*, *Educational Screen and Audio-Visual Guide Previews*, and *K-Eight* cover a variety of audiovisual materials. A lesser known, but excellent review source is *The Bay State Media Evaluation Guild* (filmstrips).

Finally, if librarians do not have what patrons are looking for, they might take the advice of one of our little ones. The conversation went something like this:

First grader: "Do you have a book about monsters and what's inside them?"

Librarian: "I'm sorry but we don't."

First grader: "Well, will you make me one 'cause that's what I want to learn about."

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## Responsibilities of Young Adult Librarians

MORITIA-LEAH FREDERICK

WHILE many book lists exist, a diligent search of the literature has turned up very little on the responsibilities of the librarian in regard to the science collection. This may be partly due to the fact that, at the time when educational funds on a federal level were largely available, only the beginnings of the problem of the science collection were tackled. Later the funds had dried, and science itself had become a dirty word.

Who are young adults? *AAAS Science Book List* (formerly "for young adults") considers them to be junior high school students through college undergraduates.<sup>1</sup> While many young adult librarians might limit the range to the high school senior, experience has shown me that the *Book List's* range is probably more realistic, chiefly because of the spread of knowledge and background existing among young people interested in science.

For what reasons does the young adult come to the library for science materials?

1. As a student he comes to the library for help with an assignment or a term paper, or for wider or deeper understanding of what he has learned in class. The usual feeling among librarians not concerned with school libraries is that textbooks are not a responsibility of the general library collection. Or, at best, textbooks should be included only on a token basis. Yet, certainly on beginning level, sometimes the textbook is the only source in which the science student can find the answers or the directions he wants, and to disregard the young adult's needs as a student is to fail his needs in the library. This is not to imply that the furnishing of textbooks is the main responsibility the librarian has for the science student. However, the furnishing of textbooks in variety and at all levels is, in science, a very important responsibility owed to the young adult as student, and librarians too often forget. The student also needs books which will

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arouse his interests, which will help him to explore and understand the physical world and himself, and which will help him to see how he can organize and use this world into which he was born. While most lists are soon outdated, they do give an idea of the kind and proportion of materials that a good collection should contain, and a list like the AAAS book list should be examined carefully for these purposes.

2. The young adult is a curious person who wants to know what makes his universe tick. He is not limited by old-hat ideas and is open to all kinds of suggestions. That is why he is such an avid reader of science fiction, why he is fascinated by UFOs, why the mysteries of the "Bermuda Triangle" engross him. He needs all kinds of scientific speculation to hone his growing knowledge and to satisfy his avid appetite, and he is going to ask for this kind of material.
3. The young adult is a doer—he wants to prove things for himself. That is one of the reasons science projects are so interesting to him. Another reason is that science projects are a means to financial aid and recognition through such scholarship programs as those of Westinghouse and the National Science Foundation. The library must satisfy his needs on these levels.
4. He comes to the library to find answers to specific questions, to learn how to use material with which he is not familiar and to seek guidance in his reading.

It is easy enough for a librarian to build a science book collection. There are general and specific lists. If the librarian's knowledge in either the general or any specific field of science is lacking, there are subject specialists available in the form of teachers, professors, or librarians of special collections who are usually glad to offer assistance. But how does the librarian fill the need of the young adult seeking reference answers, reading guidance, and interpretation of materials? Where does a teacher's responsibility end and a librarian's begin? How can a nonsubject specialist help a young person who wants to know about a specific field? How, after building a collection, can the librarian keep that collection up to date? Just how much is a librarian supposed to know?

These are the questions the literature does not probe, and yet they are the questions I have found most pertinent to my own experience both as a general librarian and as a science librarian working at all levels, and the answers are ones developed through my experience.

It is clear that no librarian can know the whole field of science and that very few librarians know even a single area. It is frequently

possible, however, to answer even difficult reference questions by knowing the usual general reference tools and using them with imagination. Encyclopedias, unabridged dictionaries, particularly *Webster's Third New International Dictionary*, and handy compendia like the *World Almanac* will supply many complete or partial answers and point out to the librarian or the young adult the direction in which to search further. This means, however, a real knowledge of the tools, and a thorough understanding of what they contain. The dividend is the ability to use these tools in disciplines other than science when there is need. The librarian should also know some good specific tools such as specialized dictionaries. And in science, more than in most disciplines, it is necessary to know what the collection contains, circulating as well as reference, and how to consult the indices of individual books. Beyond everything, it is important to know when to confess ignorance and to ask the youngster for further explanation of his problem and to inquire of the teacher, when appropriate, what he had in mind. As in all reference work, analyzing the question and defining it as exactly as possible is the first step.

The problem of the teacher's responsibility vis-à-vis the librarian is more subtle. It is rather hard to know if one is guiding a youngster or performing his assignment. It is even harder to distinguish between offering advice on where to look for term paper materials and suggesting the term paper topics. The thing to keep in mind is that the librarian supplies the materials needed, may make suggestions on how to use the material itself, and leaves the rest to both the youngster and the teacher.

One of the concepts which all librarians have by instinct is that a literature specialist is not necessarily a subject specialist. For some reason librarians tend to forget this when dealing with the literature of science. The idea still is to guide the young adult *to* the materials, but not *through* the materials. At even a very technical level, one can recognize a book on Galois algebra without knowing what Galois algebra is. In many ways I have found that in dealing with young adults a general librarian can be more helpful than one with deep knowledge of a specific subject area. (This does not apply at the levels where the student or scholar is, himself, specializing or engaging in research.) This is because the general librarian can meet the student's interest with an interest of his own as new and as novel, and they start their mutual quest from the same point.

Keeping a collection up to date requires the usual two sides of book selection: when and what to purchase and when and what to throw



away. More than any branch of knowledge, science moves. What is published today is almost outdated and what was published yesterday is sometimes already invalid. It is important to keep up with the publications that review books, and the librarian should constantly scan periodicals such as *Scientific American*, *Science*, *Sky and Telescope*, *Natural History*, *Chemistry*, *Physics Today*, *Mathematics Teacher* and *Science Teacher*. These magazines not only review current books, but usually make comparisons in their reviews that are excellent guides in discarding. *Science Books* comes out quarterly and reviews books in all fields for just the young adult reader. In building both the branch collection for which I was responsible and the more complete science collection at the Mid-Manhattan Library, *Science Books* was invaluable. *Choice* usually reviews books at a more advanced level. However, where possible, and when time allows, it is probably good to look through the publication, particularly with the beginning college students in mind. An excellent feature in *Choice* reviews is the mention of books, which though not new, are still useful and valid.

More important than reading reviews is knowing what is happening in the field of science by reading at least one newspaper with a good science section, such as the *New York Times*, and at least one magazine that keeps the current picture in view, probably *Science News*. The young adult usually picks up the latter in school and gets a lot of ideas from it. A teacher meets groups of students, is responsible for their performance, and is accountable both to his superiors and to the children's parents. A librarian usually meets young adults singly or in small cliques. The librarian can therefore listen to what the youngster has to say and find out what he really wants to know more easily than the teacher can. He can assess whether the young adult is interested only in completing an assigned stint or is interested in reading and learning further, and he can and should assist the young adult with either aim. Science, to use a cliché, really is a great adventure, especially for the young. It is a marvelous experience to know that one can ask a definite question and get a definite answer when so much else is amorphous. The librarian who is interested can not only maintain and increase the eagerness of the youngster, but can share the adventure each time the quest begins.

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## The Stockpile

HARRY C. STUBBS

IT IS NO NEWS to a parent, teacher, or a librarian that the younger generation tends to react negatively to being told what to do, read, say, play, or like; and there seems little doubt that younger generations always have been this way. The result, or at least one result, is that the education and entertainment industries share a common problem—they want people to listen to them and be impressed—although the professionals in both groups might prefer not to put it that way.

I am aware of this from the viewpoint of both fields, having been a science teacher for more than a quarter of a century and a science fiction writer for even longer.<sup>1</sup> Both facts determine how much, and in what direction, the following article is slanted. I am certainly not a completely objective writer (if there is such a thing), so it seems only fair to provide some data on my more probable prejudices.

The teacher's most conscious aim is to indoctrinate his students with a reasonably large body of usable fact and a set of attitudes reasonably compatible with his culture. In the physical and biological sciences, the "facts" must include the fact that not everything is known yet, and that there are a few techniques available for learning more. The attitudes for learning these techniques should include strong curiosity, a certain dissatisfaction with any given state of knowledge or public affairs, and as complete an absence of personal arrogance as is consistent with an adequate supply of self-confidence. An imagination able to solve problems as they arise is needed, but not needed are any more of the types who feel justified in stopping everything else while the world implements their particular plan.

The science teacher and the librarian share the problem of deciding what parts of the really overwhelming supply of existing knowledge are important enough to demand student attention and consideration, or at least to be available to maturing (and to already mature) citizens. Both professions have their limits: the teacher has only so much time to

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monopolize the pupil's attention, and the librarian only so much space for book storage and money for book acquisition. Both, therefore, tend to dip into the entertainer's budget of techniques, and compete for that part of the public wealth and student time usually budgeted for recreation and amusement. I do not criticize this at all; to the extent that acquiring useful knowledge and attitudes can be made fun, everyone is better off. Some may regret that one important criterion for *any* book is how much fun it is to read, but that must be accepted and lived with.

Another fact, of course, is that no one has time to read everything, even if there were nothing else to do. Far too many books are published to permit this. As a teacher I am required to form opinions on between three and four hundred books a year, and certainly cannot claim that every one of them is read from cover to cover in the process. A professional librarian must, I assume, make decisions on several times as many. We need not only criteria for final choice, but criteria for where to start looking.

One criterion heavily used by librarians, but not heavily tapped by teachers is customers' suggestions. Students do read, their bases of selection often being rather obscure to the over-thirty mind, and they sometimes like what they read. From the science teacher's viewpoint they may like some pretty silly stuff, since the human tendency to fall for fads and jump on bandwagons seems to develop rather early, but if they have read it and been impressed by it, the teacher has no choice but to know something about it. He may even find it advisable to have copies available so that more than one of his students may join in the debate. (Also, it is extremely unwise to risk giving the impression that you do not want people to read some item. The banned-in-Boston rating was eagerly sought by publishers in the days when things were still banned in Boston.)

Of course, reading the material may not be fun—although there is always a fair chance it will be. Nothing in this article is going to suggest an *easy* way to choose or advise on books. However, even the most irritating "science" books can be put to use (Velikovsky's *Worlds in Collision*,<sup>2</sup> which I had to put down every few pages to recover my temper, springs to mind). Specific claims or statements make good practice exercises in scientific reasoning, demanding both thought and further reading from the student. Therefore, while I would certainly not go out of my way to acquire every science book in which a student had expressed interest, I tend to jump at any chance to get a youngster into a thoughtful argument. There is astrology, most of the flying

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saucer material, pyramidology, the various health food fads—I grant that these should not take up too much of one's library shelf space, since there is far more valuable material to be housed, but neither the science teacher nor the librarian should permit himself to fossilize so thoroughly that nothing of the sort is available to his customers.

The students do not see everything, though, and often are not tempted by things we think they should study, so we cannot just wait for them to make suggestions. We have to do some picking of our own, and must therefore have some criteria determined by our own objectives and hopes—and not merely by asking “should they?” but also by asking “can they?” and “will they?” *Difficulty* is therefore a factor to consider.

The science teacher has some advantage in making this decision, but cannot claim the last word. Ideally, he wants a spectrum ranging from material pleasurable to his slowest students to things which will challenge his best. However, there are several factors which combine to make up the rather broad concept of “difficulty.”

A subject itself may be inherently complex, abstract, or both, like quantum mechanics or psychology; but a book on these or any other subjects may still vary widely in difficulty because of the writing. Here, the librarian may actually be able to make a better judgment than the subject matter teacher.

One kind of difficulty which also stems from the writer rather than the subject, however, must be left to the subject matter specialist; and since the type of book in question is likely to be tempting both to student and librarian, the science teacher has a responsibility in helping with the selection. This is the sort of book which bears, usually, a give-away title of the general nature *Golf* (or *Oil Painting*, or *Calculus*, or *Cooking*) *Made Easy*. The writer of this type of book is claiming to supply shortcuts to achieving a difficult skill, or easier ways to express a difficult subject, or more familiar analogies for some abstraction. He may actually have accomplished this, and I say nothing against the attempt in any case although I am sufficiently middle-aged and corrupted by the Puritan work ethic to doubt that anything really can take the place of conscientious practice and careful thought.

The risk in the process is the loss of precision which accompanies simplification and the substitution of broad-meaning everyday words for the more specialized and precise scientific ones. My stock example is the child's (or amateur's) astronomy book which tries to explain orbital motion with the statement that “centrifugal force exactly balances gravity” so that the orbiting object neither falls nor escapes.

This statement is not exactly wrong, although many physicists would

be bothered by the term "centrifugal force," which is merely one aspect of inertia, and the word "balance" is certainly ambiguous in this connection. Even though not wrong, however, the sentence has led to much misunderstanding because of its lack of precision. I have seen written expression, by literate adults, of the fear that sending spacecraft to the moon would upset this "exact" balance and send our satellite crashing to the earth or out into space. (If any of the present readers fall in this group, please read a work on astronomy which does not claim to be easy—e.g., a college freshman text.)

Simplifying or clarifying difficult scientific subjects is a tricky job, as is recognizing when the job has been well done. Even the best scientist or science teacher cannot spot all the possible ways in which a book, a paragraph, a sentence or even a word may be misunderstood. Simplification demands of the writer a good, clear understanding of the subject itself at the *professional* level, not just the level of the proposed reader. It demands a high degree of skill with language, or very close cooperation with an illustrator, or preferably both. The scientist who cannot write well and the writer who is not a scientist are both poor candidates for the job. It is quite common in present-day science books for children to put an impressive list of scientific consultants somewhere near the title page, but one sometimes wonders how much these people actually influence the final choice of words and illustrations. I tend to be somewhat more impressed when the scientist is listed as "coauthor," although this is not a really firm criterion.

I fear that a science book must be judged at least three ways: for accuracy by a scientist, for clarity by a nonscientist, and for effectiveness on the basis of ideas and understanding that it actually engenders in students. The last, I grant, does make things a little hard on author and publisher.

A widespread tendency exists to equate "simplified" with "nonmathematical." Indeed, I have seen the latter term used in textbook advertising as though it were a virtue. Using *advanced* mathematics in a science book intended for students untrained in the field is, of course, as pointless as employing any other language they have not yet studied. However, the physical sciences are essentially quantitative, and all students have had *some* mathematics. Mathematical notation is the clearest and most concise method of explaining any point which involves questions of "how much?" or "how many?" or "how big?"

The notation may merely involve written numbers for the child who has just learned to count, or numerical examples for the one just

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learning arithmetic, but it can and should also involve basic algebra, trigonometry, logarithms, or calculus if the intended reader can reasonably be expected to have any training in the use of these tools. I know about, and resent, the widespread antimathematical bias in the U.S. population, and feel strongly that something should be done to counter it. If the science writer makes it obvious that mathematical terminology is the easiest way to express and solve quantitative problems, we may hope that an occasional student will be stimulated to learn its use. I suggest that to the science teacher selecting books, the phrase "completely nonmathematical" on the jacket or in the sales literature is *not* a point in a book's favor.

The preceding criterion tended to overflow somewhat into the question of accuracy, which is also a point for independent consideration. I get the impression that librarians worry more about this aspect of a science book than do most science teachers, not because the latter care less, but because they feel more sure of themselves in judging the matter. I can offer the librarians some comfort.

Without belittling the importance of accuracy, please remember that no book has ever been written with *no* scientific mistakes—at least, there is no way to say that one has been, because we do not really know how many mistakes remain in our picture of the universe. Furthermore, if one ever is written it will be dated very quickly. As a science teacher I am not seriously bothered by an occasional misstatement of fact in a book, although I admit that some books go much too far in this direction.

There is, in fact, a variety of mistake, which rather pleases me, however much it embarrasses the author. This is the slip in internal consistency. I will name no names, but when a book says on one page that the year of Mars is more than twice as long as that of the Earth, and on another page that the year of Mars is 687 Earth days in length, I sit happily back and wait for my more alert students to spot the inconsistency and start finding out for themselves which of the statements (if either) is correct.

When two books intended for the same level of reader disagree on some point, I am equally happy. I regard it as extremely important that students learn, as early as possible, that scientific "knowledge" is constantly changing as new information comes in, and that unlike chess or baseball, there is no human authority in a position to state absolutely the rules of the universe we live in.

I realize and regret that this knowledge can lead to insecurity in some people. I consider this danger as much smaller than the one arising



from *lack* of this bit of truth. A person who has grown up under the impression that everything he has learned (or even that *anything* he has learned) is unassailably correct is on thin ice. He is likely to suffer far more from his collision with a nonconforming fact than is his classmate from an inability to make decisions (I realize that this view is disputable). I feel that much of humanity's social and political troubles stem from people's misplaced confidence in the validity of their own beliefs and viewpoints.

Librarians should not be overly concerned about spotting all the scientific errors in a newly acquired book. If a young reader comes up indignantly to point a new one out to you, would you really want to deprive him of the pleasure? And science teachers should delight in the useful classroom situation where two students cannot agree on whether a certain book statement is correct. I am not proposing that a whole library, or even a whole shelf, should be devoted to horrible examples. But those too stuffy about accuracy and updating will not have a library.

I have not and will not mention any specific books; no such list could be very complete, and would date far too rapidly. The production of "recommended lists" is a specialty in itself. There are many sources of suggestion—the American Association for the Advancement of Science puts out evaluation lists every few months; there is *Appraisal* from the Harvard School of Education; there are reviews in *Science*, *Scientific American*, and *The Horn Book Magazine*.

There is, however, one other general criterion which should be mentioned—that of subject matter. I mentioned above that there should be a wide range of difficulty available to the student, which naturally demands shelf space. This demand is greatly increased by the enormous variety of subjects calling themselves sciences. Someone must decide on a balance between the traditional subjects on one hand and the borderline and bandwagon ones on the other. It might seem at first that this responsibility belongs chiefly to the science teacher, but there is a danger here. Some of my esteemed colleagues, including myself, have trouble controlling the urge to dismiss a book as nonsense when it does not fit the conventional pattern. This may be the conservatism of age, or a considered opinion that basics should come first. In either case, we risk omitting books that many students will feel should be on hand; and student trust in and respect for the library as a source of information is very, very important.

I happen to be on the basic side myself; I felt that *Silent Spring* was much too emotional, and still resent the instant ecologist who does not

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seem to realize that the first blow at the "balance of nature" was not the Flit gun but the garden.

Nevertheless, students become interested in such things, and professionally I have no choice but to qualify myself to discuss them. I cannot afford to exclude all this from the library, if only because I cannot afford to have students thinking that I am trying to censor their reading.

What I can do, and all I can do, with student food faddists is to have books on scientific nutrition available, backed up by basic chemistry and biology texts. For astrologers there are the astronomy texts, plus mathematical works on the analysis of observational errors and cause-and-effect criteria. For ecologists who disapprove of the Alaska pipeline there are books on ecology by professionals, again with chemistry, biology and meteorology backups.

I teach at the high school level, but make it a point to have at least a few college and graduate school books available in the library; I feel fortunate at being close enough to Boston to be able to use a number of local university libraries for backup. Teachers should attempt to make the library's scope as wide as possible, and think twice before rejecting a book because it is palpable nonsense.

I have emphasized chemistry, biology, and the like in the foregoing paragraphs, and have emphasized belief in the importance of basic studies in depth. I do not mean by that to discount the interdisciplinary fields which keep springing up. We need them, however negatively I may react to the bandwagon syndrome. We need people who can come as close as humanly possible to viewing the whole picture at once. We also need, however, people who are aware of the vast body of detailed fact which must be uncovered and the appalling amount of work which has to be done before we can *ever* decently utter a sentence beginning with the words "I know."

There is the person who makes public pronouncements on ecological matters without knowing the difference between a microtome and a chromosome, or being able to balance a simple chemical equation. There is also the person who writes a tale of nautical adventure without knowing the difference between a sloop and a lugger, and believes that splicing the main brace is something done with rope.

The important difference between these two idiots is that the first is less likely to be found out (many readers of sea tales know something about ships) and more likely to do irreparable damage (we are irrevocably part of this planet's ecology ourselves) if he is a persuasive

talker. Even if we do not produce an entire generation of scientists, it is up to us—writers, teachers, librarians, parents—at least to produce citizens competent to recognize the scientific faddist when he starts to talk. After all, it is now about two centuries since we committed ourselves to the technology-or-starve branch of history's roads. Maybe we should not have done it, but it is much too late to complain now.

Libraries have limited space and funds, and teachers have limited time, but both should do their best to provide reading collections of broad scope in both difficulty and subject matter. They must keep their ears, eyes, and minds open. They should remember that any book which can start debate has some potential use in communication bridges.

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## Science As Literature

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WHEN EXPERTS in the field of children's literature speak or write about their field and comment on "great" literature or classics, they are usually referring to fiction. Why? Why can't an informational book—a science book—be considered in this category?

Most of the criteria by which books for children are evaluated apply to nonfiction as well as to fiction: good format, clarity, accuracy, communication of the author's attitudes, adroit use of language, and concepts and vocabulary appropriate for the age of the intended audience; no jargon or writing down; no teleology or anthropomorphism; respect for the integrity and adaptability of the reader; humor where it is appropriate; logical structure or organization; a writing style that is distinctive for its originality in the use of words and word patterns.

There are additional standards by which one may measure each kind of book. Some of the requisites of good books are: for fiction, the ways in which an author uses dialogue, develops characters, reinforces theme; for nonfiction, the ways in which the author demonstrates a scientific attitude, accuracy, currency, and sequential arrangement of material.

But are good books literature? In one sense, yes. Everything published for children is part of their literature. In the sense of great literature, no, not necessarily. What is the criterion for greatness? While the lasting pleasure a book may give to generations of children may endow it with greatness, it is primarily in the style of writing that greatness is inherent. It must be acknowledged that the books commonly accepted as children's classics are primarily fictional, although informational books do win some awards, awards not designated to be awards primarily for nonfiction or science, and many do endure. But does this not reflect, perhaps, more our traditional attitudes about what literature is than the intrinsic merit of the best in nonfiction? If the nature of the literary experience per se is to involve

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the reader in the author's creative (or created) world, to communicate excitement, to encourage the reader to go farther than the book, can it not be said that great science books do these things?

The purpose of a science book is to give information, that of a work of fiction to entertain, but it is not rare to find a story that gives information or an informational book that entertains or stimulates the imagination. A stellar example is Victor Scheffer's *Little Calf*, the description of the first year in the life of a sperm whale, written by an authority on marine biology. It begins, "It is early September when for the first time the Little Calf sees light . . .,"<sup>1</sup> and continues, "On a morning in early October the sea is glass, without a ripple or sound. A feather falls from the breast of an albatross winging its lonely way northwestward to the Leeward Islands and home. The plume drifts lightly to the sea and comes to rest on a mirror image. It is a day when time itself is still."<sup>2</sup>

The narrative style and story framework are used by many authors in writing about animal life; Robert McClung, Alice Goudey, and Bernice Kohn Hunt use them regularly and capably without anthropomorphism. Comparatively few animal books are written with the combination of authoritative knowledge and elegant prose that Scheffer contributes. Aileen Fisher also achieves it in *Valley of the Smallest*, the story of a shrew:

Undisturbed by the roar of the wind, she was snatching a bit of sleep in a sheltered place away from her nest before hunger drove her to hunt again. For hunger ruled her life. No one in the valley searched for something to eat with such continual frenzy. . . . She never sat just doing nothing, like the Snowshoe Rabbit who lived under the spruces at the edge of the old beaver flat. She never lazily sunned herself on a rock while she surveyed the world, like the Ground Squirrel who lived near the old pine. She never slept quietly all day, like the Deer Mouse. She kept on the run day and night, winter and summer, searching for something to give her the energy to keep on running and searching.<sup>3</sup>

If one of the purposes of a good science book is to communicate the author's curiosity and enthusiasm (rather than to flatly state, "This is exciting"), and one of its tests, the ability to arouse a similar curiosity, Fisher does both in her poetry. From *Feathered Ones and Furry*, "How?"

How do they know  
the sparrows and larks

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when it's time to return  
to the meadows and parks?

How do they know  
when fall is still here  
it's the "thing" to go south  
that time of the year?

Do you think that a bird  
is just smart, or, instead,  
that he carries a calendar  
'round in his head?<sup>4</sup>

Jean Graighead George, whose Newbery Award book, *Julie of the Wolves*, is the story of a feral child whose patient cultivation of wolf behavior is solidly based on observation and research, has written outstanding science books for quite diverse age groups. In *All Upon A Stone*, a provocative vignette that surveys the complex community of flora and fauna on a single stone, the text is for the primary grades reader. In *Spring Comes to the Ocean*, for ages eleven up, the author conveys a sense of wonder in dignified prose that verges—but just verges—on the lyric.

On the surface, the light ticked off the inner clock of a diatom. Sea foods flowed inside its tiny cell, and the diatom used the nitrogen and phosphorus and grew a wall which divided it in two. And each half was the same as the other. Violently they split apart and there were two glassy plants, with green spots of chlorophyl shimmering inside them. The two sections drifted apart, and the nutrients of the sea seeped through their porous walls. A delicate wall grew down the middle of each, they split and separated, and then there were four. There were eight—sixteen! And all over the ocean from Georgia south each plant that bright sunny morning took in food and split in half until there were tons of plant life by the one billion, two billions, four billions.<sup>5</sup>

While it is true that most of the science books that are distinguished for their style seem to be in the various biological sciences (from books for the very young, like Alvin Tresselt's *Hide and Seek Fog* and Golden MacDonald's *The Little Island*, to Rachel Carson's *The Sea Around Us* and *The World of the Ocean Depths* by Robert Silverberg) there are outstanding science books on almost every subject. Some of these are: Franklyn Branley's *The Christmas Sky*, based on the Christmas lecture at

the Hayden Planetarium, where the author directs the educational program; Millicent Selsam's *Birth of an Island*, lucidly written as are all her books, describing the evolution of a volcanic island; Lancelot Hogben's *The Wonderful World of Mathematics* or the provocative *Beginnings and Blunders: Before Science Began*; Isaac Asimov's *The Clock We Live On* or *Building Blocks of the Universe* and dozens of other titles as witty as they are erudite; Corinne Jacker's *Window on the Unknown*; Alan Anderson's *The Drifting Continents*; Joan Lexau's *Archimedes Takes a Bath*; and Leonard Cottrell's *Digs and Diggers*.

All of these are lively books that can stimulate curiosity and satisfy it at the same time, books written with distinction and sometimes with humor or poetic vision, books illustrated with care: pictures placed correctly in relation to the text, accurate in their captions or labels, true to scale, and often beautiful. The precision and restraint of the drawings by Edwin Tunis in his *Chipmunks on the Doorstep*, the meticulous accuracy of Anthony Ravielli in his book *From Fins to Hands*, and the brilliant colors of the paintings in Colette Portal's *Life of a Queen* all add immeasurably to both the beauty and the informational value of the texts they illustrate.

There are values in the best science books beyond the fact that they instruct or even that they excite the reader's imagination. Even such a wordless picture book as Iela Mari's *The Apple and the Moth* can stimulate a child's awareness of discovery through observation. All of the books in the Crowell's "Young Math Books" series (distinguished for the discretion with which the scope of the text is limited for the young audience) focus on basic concepts. *Chemistry of a Lemon*, by A. Harris Stone, was one of the first trade books to reflect the use, in science education, of the process approach. From books like these the reader can learn the pleasure; the objectivity; the need for patience in sifting, matching, comparing, deducing, and testing needed; the pooling and diffusion of knowledge; and the fact that there are no national boundaries in scientific knowledge.

Much of what is published for children each year is pedestrian or ephemeral. Some of it is good, some very good. Very little is great, and this is true of nonfiction and fiction. But *if* there is more fiction that is good or great, it is still true that some informational books—science books among them—stand out as distinguished exceptions to the mass of what is now in print. Perhaps we have not fully appreciated what we have. Certainly in the comparative paucity of books from abroad (a paucity, for example, compared to the British fiction that appears in American editions) and in the slighting of nonfiction in our major

awards, we may be accused of partiality. Perhaps we tend to forget that children not only need both fiction and nonfiction, but that, as Lillian Smith says in *The Unreluctant Years*, "A child's instinct to learn comes from his wonderings, his curiosity. The more his mind opens to wonder, the more sensitive he is to the satisfactions and enjoyments our earthly life affords. . . . As soon as he can read, a child is attracted to books which give tangible form to the vague shape of his imaginings about his world."<sup>6</sup>

The brief bibliography that follows the References does not purport to be comprehensive. It includes some of the more important books of past years, and stresses recent books that may not yet be widely known. It is divided, roughly, into books for young children up to the age of eight, children from eight to twelve, and young adults of twelve and up. All of the age ranges are suggested rather than delimiting, since children read widely below and above their usual range when stimulated by subject interest. The list does not begin to represent the prolific achievements of such writers as Isaac Asimov, Millicent Selsam, Irving Adler, Herbert Zim, or Robert McClung—it will be the pleasant task of those unfamiliar with their work to find their many books, and a pleasant reminder to those who already know them.

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- George, Jean G. *Spring Comes to the Ocean*. John Wilson, illus. Crowell, 1965. Gr. 6 up.
- Hirsch, S. Carl. *On Course! Navigating in Sea, Air, and Space*. William Steinel, illus. Viking, 1971. Gr. 6-9.
- Hogben, Lancelot T. *Beginnings and Blunders; Or, Before Science Began*. Grosset & Dunlap, 1971. Gr. 7-10.
- . *The Wonderful World of Mathematics*. Rev. ed. Doubleday, 1968. Gr. 6-9.
- Jacker, Corrine. *Window on the Unknown; A History of the Microscope*. Scribner, 1966. Gr. 8 up.
- Kind, Stuart, and Overman, Michael. *Science Against Crime*. Doubleday, 1972. Gr. 6 up.
- Land, Barbara. *Evolution of a Scientist; The Two Worlds of Theodosius Dobzhansky*. Crowell, 1973. Gr. 7 up.
- Langone, John. *Death is a Noun; A View of the End of Life*. Little, Brown, 1972. Gr. 8-12.
- McCoy, J.J. *The Hunt for the Whooping Cranes; A Natural History Detective Story*. Ray Abruzzi, illus. Lothrop, Lee, and Shepard, 1966. Gr. 7-10.
- Marzani, Carl. *The Wounded Earth; An Environmental Survey*. Scott/Addison, 1972. Gr. 6-10.
- Navarra, John. *Our Noisy World*. Doubleday, 1969. Gr. 6-9.
- Perry, Bill. *Our Threatened Wildlife; An Ecological Study*. Coward-McCann, 1970. Gr. 7-10.
- Reed, W. Maxwell. *The Stars for Sam*. Rev. ed. by Paul F. Brandwein. Harcourt, Brace, 1960. Gr. 6-9.
- Scheffer, Victor. *Little Calf*. Leonard E. Fisher, illus. Scribner, 1970. Gr. 7 up.
- Shippen, Katherine. *Men, Microscopes, and Living Things*. Anthony Ravielli, illus. Viking, 1955. Gr. 8-10.
- Silverberg, Robert. *The World of the Ocean Depths*. Meredith, 1968. Gr. 6 up.
- Simon, Hilda. *Living Lanterns; Luminescence in Animals*. Hilda Simon, illus. Viking, 1971. Gr. 7 up.
- Smith, Norman. *Wings of Feathers, Wings of Flame; The Science and Technology of Aviation*. Little, Brown, 1972. Gr. 7 up.
- Stambler, Irwin. *Automobile Engines of Today and Tomorrow*. Grosset & Dunlap, 1972. Gr. 7-12.
- Valens, Evans. *The Attractive Universe; Gravity and the Shape of Space*. World, 1969. Gr. 7-10.

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## Science Periodicals for Children and Young People

IRENE K. LOGSDON

PERIODICAL LITERATURE in the field of science should be considered one of the most important sources of up-to-date information for students and teachers alike. In fact, those schools that have not been able to budget for a collection of materials that meets or even approaches the standards established by the American Library Association,<sup>1</sup> would be well advised to give priority to establishing a collection of science periodicals for their students and teachers at all educational levels if they wish to maintain a viable science program.

The following list of science periodicals represents the broadest perspective of the term science, including both the pure and applied physical and biological sciences as well as mathematics, agriculture, medicine and technology. The titles listed have been selected primarily for their potential to enrich one or more aspects of the science curriculum. They cover a wide variety of reading levels as well as a range of student interests. It is assumed that students who have achieved a grade twelve reading ability will be able to read and understand, providing it is a subject of interest to them, most written materials other than those designed for the specialist in a particular field. Since it is not uncommon for even some junior high school students to achieve this reading ability, educators should not be timid about exposing students to advanced ideas and concepts. Had there been more exposure to the content of science periodicals in the recent past, the general public would not have been so shocked when confronted with the ecological crisis. "More than any other group of men and women, scientists live with the terrifying knowledge of humanity's precarious balance on the edge of self-destruction."<sup>2</sup>

Unfortunately, there are very few science periodicals aimed solely at the elementary school pupil. Due to the nature of the subject and the need for precise terminology, the reading and understanding of scientific literature is more difficult for the beginning reader than is

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the literature of many other subject areas. Consequently, many more titles are suitable for the upper elementary and junior high school levels than for the primary grades. The selection increases dramatically at the senior high school level.

Since each issue of a periodical contains a number of articles, the possibility increases that a given title will relate to a variety of interests at a given grade level as well as to a relatively wide range of grade levels. For this reason, the same title might properly be included on school subscription lists at several grade levels.

The more popular titles, as opposed to the more scholarly titles particularly in the applied science and technology fields, can be used to help bridge the gap between the "new science" programs that place great emphasis on mathematical skills and the average and less than average student who cannot achieve these skills but still needs to understand the basic scientific concepts that operate in the society in which he lives. Students who would not voluntarily pick up an issue of *Scientific American* may be avid perusers of *Popular Mechanics* and know precisely when the new issue can be expected to arrive.

If economy is the dominant influence, then emphasis should be given to titles of a relatively general nature. However, the school has a responsibility to meet the total range of student and faculty concerns even though the more specialized titles, such as *Chemistry*, would appeal to relatively few readers. The school has a responsibility for making this kind of material available because many of these titles are not available on newsstands, and it is unlikely that many families would be subscribers.

The potential usefulness of a periodical collection in the sciences, as in other fields, will depend not only on the maintenance of orderly files, but also upon the availability of subject indexes. These should include as a minimum the *Abridged Readers' Guide to Periodical Literature*, the *Readers' Guide to Periodical Literature*, and the *Subject Index to Children's Magazines*, depending on the level of the school. Some publishers supply annual indexes, a few of which are cumulative.

The principles for the selection of periodical titles in the field of science, as defined for this list, are essentially those for the selection of any science material, print or nonprint. Authenticity, up-to-dateness, and readability are of prime significance. The nature and breadth of the science program itself are primary determinants in the selection. Where a given title is indexed helps the selector determine the major emphasis and level of use. The enrichment value of advertisements should not be overlooked whether they are for laboratory equipment,

### *Science Periodicals*

farm machinery or short correspondence courses. The final list selected for a particular school should span the full range of student and faculty needs.

The following list includes forty-six titles presented in an arrangement to relate them to the school levels where they might be of the greatest use. Of these, fifteen could be useful in the elementary, junior high and senior high school; three span the elementary and junior high levels; eleven, the junior high and senior high levels; sixteen at the senior high only and one for the elementary level only.

These titles have been selected from *Periodicals for School Libraries*, an inclusive listing with extensive annotations.<sup>3</sup> The reader is referred to this publication for full descriptive and bibliographic information. The grade level usage established by this publication is used here, and the annotations have been digested from material prepared earlier for the ALA publication. Subscription prices have not been included since they are subject to frequent change. Publications of Scholastic Magazines, Inc. were not included since they are not always available in single subscriptions. Notation is made if the periodical is published by a society, museum or other noncommercial organization.

Indexing is indicated by the following abbreviations:

Abr.R.G. *Abridged Readers' Guide to Periodical Literature*

A.S.&T.Ind. *Applied Science & Technology Index*

Biol.Abstr. *Biological Abstracts*

Biol.&Agri.Ind. *Biological & Agricultural Index*

Chem.Abstr. *Chemical Abstracts*

Ind.Child.Mag. *Subject Index to Children's Magazines*

R.G. *Readers' Guide to Periodical Literature*

### *References*

1. American Association of School Librarians and the Department of Audiovisual Instruction of the National Education Association. *Standards for School Media Programs*. Chicago, ALA, 1969.

2. [Editorial] "Warning to Moscow," *New York Times*, Sept. 11, 1973, p. 42.

3. American Library Association. Periodicals List Subcommittee. *Periodicals for School Libraries: A Guide to Magazines, Newspapers, and Periodical Indexes*. Rev. ed. Marian H. Scott, comp. and ed. Chicago, ALA, 1973.

### *The Basic List*

*The following category is general in coverage and might be found useful at each major educational level: elementary, junior high and senior high school.*



- Animals* is a British publication devoted to the cause of conservation on a worldwide basis. A particular concern is species in danger of extinction. Two special features of interest to elementary students are: "Zoo News" and "Zoo Guide." The British terminology is an added interest for American students.
- Aquarium* provides extensive information about the care and habits of tropical and marine fish. The color illustrations are both helpful and attractive. Schools that maintain aquariums will find this publication most useful. Biol.Abstr.
- Audubon* is the official publication of the National Audubon Society. It reports conservation news and natural history items from a world front. Of particular interest are the magnificent photographs in black and white, with some in color. It provides enrichment especially for elementary teachers and for science programs at all levels. Biol.Abstr.,R.G.
- Canadian Audubon* is a voice of the Canadian Audubon Society with emphasis on the conservation and natural history concerns in Canada. A special feature, "Audubon Youth," is of particular interest to the elementary school student. Ind.Child.Mag.
- Defenders of Wildlife News*, although more popular and sentimental in tone than Audubon, does bring a wide variety of nature study news of interest to a wide range of age groups. Each issue carries a review of legislative news relative to conservation. Cumulative Index.
- Farm Journal*, as suggested by the title, is dedicated to the interests of farmers and their families. The advertisements and illustrations open up a foreign world to the urban child. The style is somewhat folksy but the covers and general format are very attractive. It is published in six editions to fill the needs of different sections of the country. Abr.R.G.,R.G.
- Mechanix Illustrated: The How-To-Do Magazine* emphasizes the practical approach to many student interests from hints on car purchasing to the pitfalls of bee keeping.
- National Parks and Conservation Magazine* emphasizes ecology, preservation of wilderness areas and conservation concerns. The beautiful black and white photographs add to the interest and usefulness. R.G.
- National Wildlife*, a publication of the National Wildlife Federation, is illustrated with spectacular color and black and white photographs. The many short articles cover a multitude of conservation-related topics written in a style easily readable for elementary students but still of interest to older groups. Abr.R.G.,Ind. Child. Mag.,R.G.
- Natural History* is generously illustrated and thus of interest to the elementary student even though the articles are written in a scholarly fashion. The full range of the natural sciences is covered—from monthly star charts to anthropology. It is published by the American Museum of Natural History. Abr.R.G.,Biol. Abst.,R.G.
- Outdoor World* emphasizes the study and preservation of the natural world and is especially outstanding for the color and black and white photographs. The many special features suggest activities of interest to young adults as well as children. This is a useful acquisition at any educational level.

### *Science Periodicals*

*Popular Mechanics*, another how-to-do-it publication, has its emphasis on cars, boats and other outdoor activities. The advertising is extensive but is of interest to the reader. Abr.R.G., Ind.Child. Mag., R.G.

*Popular Science Monthly* covers a somewhat wider range of subjects than *Popular Mechanics* and gives special emphasis to vocational and self-help programs. The style is popular and the advertising voluminous. Abr.R.G., Ind.Child.Mag., R.G.

*Science News of the Week* is more like a small newspaper than the traditional periodical. The style is journalistic and the short reports cover a great many items in all the science fields, including the medical and behavioral sciences. In addition, each issue includes several long articles. Abr.R.G., R.G.

*Sea Frontiers* has particular value for programs in the earth sciences but is also of general interest to young people. The articles, written in a popular, readable style, are based on reliable research. It is well illustrated with both black and white and color photographs. *Sea Secrets* is an information service published every other month and is a part of the subscription. R.G.

#### *Of interest and useful at the elementary school level.*

*Ranger Rick's Nature Magazine*, publication of the National Wildlife Federation, continues the conservation concerns of this organization at the elementary interest and reading level. This covers a wide range of the natural sciences with articles and activities written and illustrated in a manner to appeal to children. There is also a guide to classroom activities available with the subscription to teachers. Annual index.

#### *Useful at both the elementary and junior high levels.*

*Boys' Life*, the popular publication of the Boy Scouts of America, reflects the interests of boys from eight to fourteen years. Outdoor life, campcraft, and appreciation and care for animal and plant life dominate the stories and articles with emphasis on activities that boys can do themselves. Ind.Child.Mag.

*Curious Naturalist*, a publication of the Massachusetts Audubon Society, is particularly useful as an educational material because the articles and suggested activities are especially designed to encourage interest in and curiosity about the natural world. The attractive combination of print size and illustrations invite the young reader.

*Current Science* is a newspaper-like weekly that is also available in bulk subscriptions with a teacher's edition. The format is not particularly attractive, but the wealth of information in each issue makes this a valuable addition to the science program.

#### *Useful at the junior and senior high levels.*

*American Forests: The Magazine of Forest, Soil, Water, Wildlife, and Outdoor Recreation*, a publication of the American Forestry Association, places great emphasis on conservation. While a few of the articles are technical, the major portion of each issue is of interest to young

people. Current legislation dealing with conservation is reported. The photographic illustrations are spectacular and each issue contains appropriate poetry reminiscent of some of the Sierra Club publications. R.G.

*Catalyst for Environmental Quality* is primarily interested in encouraging public concern for conservation on a worldwide basis. Of particular import to schools is the annotated list of educational materials that are available and also the listing of career opportunities in this field. Although aimed at an adult readership, the information is usable in school programs.

*Earth Science: Official Publication of the Midwest Federation of Mineralogical Societies* covers the fields of geology, meteorology, oceanography and archeology. The articles are written in a style that is readily readable by secondary school students. This publication has particular significance for earth science programs. Annual index.

*Electronics Illustrated* presents, in an informal style, articles of interest to the radio and stereo buff. Although technical, it is less sophisticated than some electronics publications. The advertising is extensive but of great interest to those interested in this field.

*Environmental Quality Magazine* covers the full gamut of the subject of conservation and ecology from politics to food quality. It is interestingly illustrated, and the general format is attractive. It is a relatively new venture and as yet is not included in an indexing service.

*Fauna: The Zoological Magazine* is a new publication covering, on a worldwide basis, information about unusual animals. The illustrations are excellent. Books and articles from other publications are annotated with the reading level indicated. This feature is particularly valuable for the teacher.

*Organic Gardening and Farming* is a folksy type publication devoted to protecting our environment as well as the quality of our life. Suggestions for the control of pests through natural means and recipes for preparing natural foods are included. It would be of particular use in biology programs where plant cultivation is part of the curriculum. Biol.&Agri.Ind.,R.G.

*Popular Electronics* gives detailed information about and instruction in the building of electronic devices. Many kinds of equipment are evaluated. Of particular interest to secondary school students is the schedule for FCC license examinations. Abr.R.G.,R.G.

*QST: Devoted Entirely to Amateur Radio* is a publication of the American Radio Relay League, Inc. It emphasizes the construction of radio sets and stations. Detailed information on the various licensing levels and FCC regulations are included. The advertising is extensive and of interest to the radio "ham." A.S.&T.Ind.

*Rock and Gem*, a fairly new publication, treats minerology in a popular manner. Places where gems and precious stones can be found are listed, and the lore surrounding gems is included. The illustrations are both interesting and excellent.

*School Science and Mathematics* is a publication of the Mathematics Association.

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Although aimed primarily at the teacher, there are many features and articles that would be helpful to the secondary school student who is working on special projects. The articles, although technical, are readable and understandable by the advanced mathematics student. Chem.Abstr.

*Useful at the senior high level.*

*American Scientist* reports the results of scientific research from a wide perspective of science subjects. Both the writing and the format are scholarly, but the subject matter is understandable by the advanced science student. A.S.&T.Ind.,Biol.Abstr.,Chem.Abstr.

*Archeology* is a publication of the Archeological Institute of America. Increasing interest in this field and the new high school emphasis on archaeology make this a worthwhile title. Coverage is worldwide and the fine illustrations in both black and white and color add to its attractiveness and usefulness.

*BioScience*, a publication of the American Institute of Biological Sciences, reports the findings of research in the biological sciences with emphasis on those aspects that effect man's quality of life. Although scholarly, the material is interesting and readable. Sets of the art covers may be purchased separately. The advertising, largely for laboratory equipment, is especially useful to teachers.

*CQ: The Radio Amateur's Journal* is for the radio and electronics buff. The wiring charts and detailed illustrations and explanations are useful for anyone interested in this subject.

*Chemistry* is a publication of the American Chemical Society and thereby scholarly. It is aimed, primarily, at the professional chemist. The high school student who is interested in a career in chemistry would find helpful information concerning opportunities for study and areas currently being studied. Chem.Abstr.,R.G.

*Computers and Automation* keeps the reader up to date in the rapidly changing technology in computer programming and systems analysis. The longer articles frequently describe the application of computer science to social problems. This is useful as an enrichment for computer education programs.

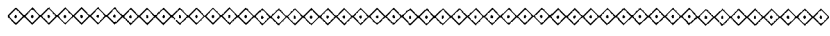
*Discovery*, a publication of the Peabody Museum of Natural History Associates, emphasizes the findings of the museum staff expeditions, many of which are in the field of anthropology.

*Living Wilderness*, a publication of the Wilderness Society, is particularly concerned with educating citizens to participate politically in conservation matters. It is useful with high school ecology activities and interests. R.G.

*Oceanology International & Offshore Technology* reports news of technological developments in this field. The style is readable, and the advertising is mostly for equipment and instruments. The section listing employment opportunities is of interest to high school students. The subscription includes a yearbook.

*Physics Today: A Publication of the American Institute of Physics* is to the field of physics as *Chemistry* is to the field of chemistry. It is scholarly, but the

- advanced student in physics would find it of interest. Information on various kinds of jobs available to physicists is reported. A.S.&T.Ind., Chem. Abstr., R.G.
- Science*, a publication of the American Association for the Advancement of Science, is scholarly in content and presentation. It is its policy to present both sides of controversial issues and this leads to an interesting letter section. Abr.R.G., A.S.&T.Ind., R.G.
- Science and Public Affairs* (Bulletin of the Atomic Scientists) stresses the knowledge gap that may exist between those who make policy and laws and those who are technology experts. The style is easily readable and the articles are illustrated. Future citizens should be made aware of the concerns emphasized in this publication. R.G.
- The Sciences*, a publication of the New York Academy of Sciences, includes articles in each issue in many areas of science. It helps bridge the gap between *Popular Mechanics* and *Scientific American*. The articles are readable and of interest to the general student.
- Scientific American* gives a broad coverage of the field of science. The articles are scholarly but readable and of interest to the advanced high school student. Excellent illustrations and charts as well as an attractive format invite readers. This magazine can be a genuine enrichment for the science program. Abr.R.G., A.S.&T.Ind., R.G.
- Sky and Telescope* is concerned with developments and observations in the field of astronomy. The sky chart includes detailed explanations of month-to-month changes in the sky. Even though astronomy, as such, is not usually a part of the high school curriculum, many high school students are interested in the movements of the stars. R.G.
- Weather*, a publication of the Royal Meteorological Society, is technical in content but includes unusual black and white photographs of weather phenomena. A few features of particular interest to young people—weather maps, etc.—are included in each issue. General science and earth science programs could make use of this publication.



## Science Reference Materials for Children and Young People

RICHARD L. STRICKLER

THIS is a list of recent science reference books covering subjects from mathematics and earth science to medicine, chosen with both students and teachers in mind. We sometimes underestimate the ability of some students to comprehend the printed word, but we do know that if a student has any background in a subject he can very often read about it beyond his grade level. Reference books, of course, are for both the inexpert student and the more advanced student, for the one who may or may not need help in looking for bits and pieces of information that he will put together in his own way, and for the other who, on his own, can find and make use of much fuller information that will satisfy him as it is.

The librarian-media specialist in both school and public libraries must choose books that fill the needs of the school curriculum as well as the needs of the students, including material for any special projects they may have: science fairs, science award competitions, etc. A record of books that circulate is easy to keep, and from it the need for more materials can be ascertained; then more books can be selected and purchased that enhance the circulating collection. It is difficult, however, to keep use records of reference books, so the librarian needs to be almost clairvoyant and must be able to anticipate needs.

There is a trend in some school libraries away from the separate reference collection, letting all reference books circulate on an "overnight" basis. Although the books are still marked "Reference," they are shelved with other books in their regular Dewey classes, thereby putting all books on the same subject in one place in the library.

One problem that often confronts elementary school librarians is the identification of specimens that students bring to school which the teacher cannot identify. The foresighted librarian will have a stock of simple keys that will aid in the identification. In these cases a call to the

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area library will be of no use, except, perhaps, for direction to a reference book that is already in the school's library. Good sets of zoological and botanical keys are essential for all grade levels, and copies should be available for circulation as well as for reference. Problems in other areas can be dealt with in the same way, by having the proper tools readily available.

One factor limiting any collection is the amount of money available. Another factor that might affect a school library collection is the nearness of good public library service. Outside service may be supplied by local, regional, county, or area libraries; by college or university libraries; or by state libraries. If any of these libraries is close enough to drive to, or if there is a statewide library network, as in New Jersey, then reference service is as close as the nearest public library or even the nearest telephone, and many reference materials can be dispensed with in the school library. Telephone reference service is good for the short one-fact question but not for identification of an insect, a dinosaur bone, or an organic formula. Good library service that can be had by going to a public library will be helpful to those who can travel by car. But in the long run, if the material can be acquired by the school library then that is where it belongs, and the other libraries can be used to supplement the school library's collection.

Books have been included in the list (1) if the title fits under the general heading of science or technology, (2) if the information in the book can be used by students or teachers in grades K through 12, (3) if the title fills a need or an interest of students or teachers in grades K through 12, and (4) if the title is in the 1973 edition of *Books in Print (BIP)*.

A note on the grade level code used in the list: a number of books have been included which perhaps cannot be used by some students on their own, but which can be used with help from a teacher or a librarian. Restricting books by reading levels would exclude much valuable material from those students who may lack the necessary skill but who have high motivation. The code is: 1 (K-3), 2 (4-6), 3 (7-8), 4 (9-12), 5 (teachers and librarians).

*Editor's note:* Because of space limitations, books published before 1964 have not been included even though there are a number of excellent older titles still in print, although usually in rather specialized areas, which have not been superseded. For the same reason, some important publishers' series have not been included even though the titles are noteworthy and would find place in both reference and

### *Science Reference Materials*

circulating collections of flora, fauna, rocks, shells, stars, and other "things" of nature.

All of these series are reasonably priced. Some series examples include: (1) Peterson Field Guide Series published by Houghton-Mifflin, 19 titles; (2) Picture-Key Nature Series published by William C. Brown, How To Know books, 32 titles; (3) Golden Field Guides, 5 so far, and the smaller format Golden Nature Guides (21 in print) and Golden Science Guides (8 in print) published by Western; (4) Putnam's Nature Field Books, 18 in print; (5) Doubleday Nature Field Books, 18 in print; (5) Doubleday Nature Guide Series, 9 in print; and many publications of government agencies such as the U.S. Department of Agriculture *Yearbooks* and the U.S. Atomic Energy Commission's Understanding the Atom Series and The World of Atom Series, both of which are free.

The brief, somewhat standardized annotations were condensed from the compiler's notes on the titles and up-dated if necessary. Some titles, including the bibliographic aids, have been added by the editor. The prices, mostly from the 1973 *BIP*, are advisory only and are, of course, subject to change.

### *Recent Science Reference Books*

#### *General Science Encyclopedias and Dictionaries*

Ballentyne, D. W., and Banford, A. P. *Dictionary of Named Effects and Laws in Chemistry, Physics, and Mathematics*. 3d ed. Wiley, 1970. \$9.50

An advanced work, for advanced students and for teachers of advanced science courses. 4, 5

*Book of Popular Science*. 10 vols. Grolier, 1973. \$90

A browsing set divided into 15 groups or departments with excellent illustrations. Index in last volume; separate paperback indexes available from publisher. 1, 2, 3, 4

*Britannica Yearbook of Science and the Future*. Encyclopaedia Britannica, annual. Price varies

Updates the science parts of the *EB*. Excellent drawings and photographs. Particularly useful for libraries not getting the new *EB* every year. 3, 4, 5

Collocott, T. C., ed. (*Chambers*) *Dictionary of Science and Technology*. Barnes and Noble, 1972. \$23.50

Comprehensive, up to date, clear definitions but with some British bias in spelling and usage. 4, 5

*Harper Encyclopedia of Science*. Rev. ed. Harper, 1967. \$40

Dictionary format with signed articles varying in length and in degree



RICHARD L. STRICKLER

- of difficulty. Clear photographs and diagrams, some in color. 1, 2, 3, 4, 5
- McGraw-Hill Encyclopedia of Science and Technology*. 3d ed. 15 vols. McGraw-Hill, 1971. \$360  
Very thorough coverage of all fields of science; fuller, more specialized than most general encyclopedias. Clear illustrations. 4, 5
- McGraw-Hill Yearbook of Science and Technology*. McGraw-Hill, annual. Price varies  
Topical survey articles plus updating of parent set between editions. Excellent photographs and other illustrations. 4, 5
- Popular Science Magazine, ed. *Popular Science Encyclopedia of the Sciences*. Grosset, 1968. \$6.95  
A one-volume work with cross-references and index. A study guide aids readers in seeing interrelationships among the sciences. 2, 3, 4, 5
- Science Year: The World Book Science Annual*. Field Enterprises, annual. Price varies  
Updates the science parts of the *WB*. Excellent drawings and photographs. Particularly useful for libraries not getting the new *WB* each year. 2, 3, 4, 5
- Van Nostrand's Scientific Encyclopedia*. 4th ed. Van Nostrand Reinhold, 1968. \$42.75  
One volume, dictionary format, cross-referenced; definitions vary in length from one sentence to several pages, and in difficulty. 4, 5
- 510 Mathematics (and Computers)*
- Abramowitz, Milton, and Stegun, Irene A., eds. *Handbook of Mathematical Functions with Formulas, Graphs, and Mathematical Tables*. Dover, 1964. \$6.95  
Covers everything in mathematics; subject index, notation index, Greek letter table, notation tables. 4, 5
- Bendick, Jeanne, and Levin, M. *Mathematics Illustrated Dictionary: Facts, Figures, and People Including the New Math*. McGraw-Hill, 1965. \$4.50  
Terms defined; portraits and articles on great mathematicians. Cross-referenced. 2, 3, 4
- James, Glenn, and James, Robert C. *Mathematics Dictionary*. 3d ed. Van Nostrand Reinhold, 1968. \$14.50  
Complete dictionary with good short definitions, plus appendices, log tables, mortality table. 4, 5
- Selby, Samuel M. *CRC Handbook of Tables for Mathematics*. 4th ed. Chemical Rubber Co., 1970. \$26.50  
For the advanced student; a math teacher or a librarian may be needed to help students use the book. Good for teacher reference. 4, 5
- Selby, Samuel M., ed. *Standard Mathematical Tables*. 20th ed. Chemical Rubber Co., 1972. \$5.95, text ed.  
Similar to the *CRC Handbook* above, but less expensive. 4, 5
- Jordain, Philip B., ed. *Condensed Computer Encyclopedia*. McGraw-Hill, 1969. \$15.50  
Alphabetically arranged with long thorough definitions of terms, but with a minimum of illustration. 4, 5

## Science Reference Materials

- Schmalz, Larry C., and Sippl, Charles J. *Computer Glossary for Students and Teachers*. Funk and Wagnalls, 1973. \$6.95  
Good basic vocabulary clearly defined. 3, 4, 5
- Sippl, Charles J., and Sippl, Charles P. *Computer Dictionary and Handbook*. 2nd ed. Sams-Bobbs-Merrill, 1972. \$16.95  
A 14,000-term dictionary plus 13 chapters of handbook material on systems, languages, flowcharts, models, the industry, etc. For teachers. 4, 5

### 520 Astronomy

- Alter, Dinsmore. *Pictorial Guide to the Moon*. 3d ed. Crowell, 1973. \$8.95  
Over 200 excellent photos of the moon's surface taken by Earth observatories and by lunar astronauts. 2, 3, 4, 5
- Levitt, I.M., and Marshall, Roy K. *Star Maps for Beginners*. Simon and Schuster, 1964. \$4.50  
For beginners of all ages, introduction clarifies use of maps. The maps look simple, but the subject is complex. 2, 3, 4, 5
- Moore, Patrick, ed. *Atlas of the Universe*. Rand McNally, 1970. \$35  
Superb illustrations, excellent index, great for browsing. 1, 2, 3, 4, 5
- New Space Encyclopedia*. 3d ed. Dutton, 1969. \$14.95  
Dictionary format; covers astronomy and space exploration. Definitions range from one sentence to two pages. Cross-referenced. 2, 3, 4, 5
- Nicolson, Iain. *Exploring the Planets*. Grosset, 1971. \$3.99, library binding.  
Elementary level, simple but thorough, with good color illustrations and a good index. 1, 2, 3
- Weigert, A., and Zimmerman, H. *Concise Encyclopedia of Astronomy*. American Elsevier, 1968. \$9  
Dictionary format with good illustrations; definitions and articles range from one sentence to several pages. 4, 5

### 530 Physics-540 Chemistry (and Mineralogy)

- American Institute of Physics Handbook*. 3d ed. McGraw-Hill, 1972. \$49.50  
Over 90 chapters by subject experts; for advanced students with good mathematics backgrounds. Extensive index. 4, 5
- CRC Handbook of Chemistry and Physics*. 54th ed. Chemical Rubber Co., 1973, about \$26  
"The" handbook, comprehensive, thorough, authoritative, but users may need guidance from a science teacher or a science librarian. 4, 5
- Dean, J. A., ed. *Lange's Handbook of Chemistry*. 11th ed. McGraw-Hill, 1973. \$15.50  
Covers chemical and physical properties of elements, compounds, minerals, industrial materials; includes many excellent tables. 4, 5
- Grant, Julius, ed. *Hack's Chemical Dictionary*. 4th ed. McGraw-Hill, 1969. \$31.50  
Includes 55,000 definitions giving both American and British viewpoints. Concise, thorough coverage with numerous cross-references. 4, 5
- Hampel, Clifford A., and Hawley, Gessner G. *Encyclopedia of Chemistry*. 3d ed.

RICHARD L. STRICKLER

- Van Nostrand Reinhold, 1973. \$39.50  
Seeks to cover all aspects of chemistry in over 800 signed articles, both theoretical and practical. References, cross-references, index. 4, 5
- Hawley, Gessner G. *Condensed Chemical Dictionary*. 8th ed. Van Nostrand Reinhold, 1971. \$27.50  
Thorough coverage of terms in general use in chemistry, the process industries, pharmaceuticals, etc.; includes trademarks, packaging. 4, 5
- Hurlbut, Cornelius S., Jr., ed. *Dana's Manual of Mineralogy*. 18th ed. Wiley, 1971. \$16.95  
An old standby in the field of mineralogy, with both a general index and a minerals index. 4, 5
- Miall, L. Mackenzie, and Sharp, D. W. eds. *A New Dictionary of Chemistry*. 4th ed. Wiley, 1968. \$15.50  
Concise definitions with *see* and *see also* references; illustrations are organic formulae. 4, 5
- Steere, Norman V., ed. *CRC Handbook of Laboratory Safety*. 2d ed. Chemical Rubber Company, 1971. \$25  
Chemical and microbiological hazards of various kinds; first aid; eye care; safety programs; equipment; lab animals. Bibliographies, index. 4, 5

550 Earth Sciences

- Challinor, John. *Dictionary of Geology*. Oxford, 1967. \$7  
Concise definitions, clear and understandable. List of prefixes and suffixes used in geology. Has British flavor. 2, 3, 4, 5
- Fairbridge, Rhodes W., ed. *Encyclopedia of Earth Sciences*. 8 vols. Van Nostrand Reinhold. Vol. 1: *Encyclopedia of Oceanography*. 1966. \$27.50; Vol. 2: *Encyclopedia of Atmospheric Sciences and Astrogeology*. 1967. \$38.50; Vol. 3: *Encyclopedia of Geomorphology*. 1968. \$39.50; Vol. 4: *Encyclopedia of Geochemistry and Environmental Science*. 1972. \$49.50.  
Subsequent volumes will cover geophysics, structure, and petrology; applied geology and sedimentology; stratigraphy and paleontology; and world geology (plus biographies).  
Dictionary format, in-depth treatment; articles signed, some cross-referenced to other volumes in set; bibliographies; indexes. 4, 5
- Fenton, Carroll L., and Fenton, Mildred A. *The Rock Book*. Doubleday, 1970. \$12.95  
Chapters based on rock origins: from the depths, from the sky, from solutions, etc. Good illustrations. 2, 3, 4, 5
- Todd, David K., ed. *Water Encyclopedia*. Water Information Center (Port Washington, N.Y.), 1970. \$27.50  
Includes nine chapters of resources and use tables: climate and precipitation, surface water, water quality, pollution control, agencies, etc. 3, 4, 5
- United States Weather Bureau. *World Weather Records 1951-1960*. 4 vols. Superintendent of Documents. Vol. 1: *North America*, 1965. \$2.75; Vol. 2: *Europe*, 1966. \$3.00; Vol. 3: *South America, Central America, West*

## Science Reference Materials

*Indies, Caribbean, Bermuda*, 1966. \$2.50; Vol. 4: *Asia*, 1967. \$3.25.  
Inexpensive guide to climate and weather around the world. 3, 4, 5

### 570 Biology

*Encyclopedia of the Life Sciences*. 8 vols. Doubleday, 1964-1967. \$4.95 each. Vol. 1: *The Living Organism*, Vol. 2: *The Animal World*, Vol. 3: *The World of Plants*; Vol. 4: *The World of Microbes*; Vol. 5: *The Human Machine: Mechanism*; Vol. 6: *The Human Machine: Disorders*; Vol. 7: *The Human Machine: Adjustments*; Vol. 8: *Man of Tomorrow*. (Translation of a French work).

Excellent photographs and photomicrographs. Index in each volume and set index in Vol. 8. Note: Vols. 1-3 may be out of print. 2, 3, 4, 5

Firth, Frank E., ed. *Encyclopedia of Marine Resources*. Van Nostrand Reinhold, 1969. \$25

Signed articles with bibliographies for further reading. Covers economic side of marine life. Good index. 3, 4, 5

Gray, Peter. *Encyclopedia of Biological Sciences*. 2d ed. Van Nostrand Reinhold, 1970. \$26.95

Detailed, signed articles in dictionary format, for the advanced student and teacher. Excellent illustrations. Index. Bibliographies. 4, 5

Gray, Peter. *Handbook of Basic Microtechnique*. 3d ed. McGraw-Hill, 1964. \$10.95

Introduction to the microscope and its use and to the preparation and use of microscope slides, in botany, zoology, medical technology. 3, 4, 5

Gray, Peter. *Student Directory of Biology*. Van Nostrand Reinhold, 1973. \$7.95

Includes all important genera, roots of terms, combining forms, key to pronunciation, clear definitions. 3, 4, 5

Parker, Bertha M. *New Golden Treasury of Natural History*. Golden, 1968. \$5.95

Excellent introduction to the natural sciences, in color. A browsing book with an index. 1, 2, 3

Steen, Edwin B. *Dictionary of Biology*. Barnes and Noble, 1973. \$8.50

For students of all levels. Concise definitions in nontechnical, accurate language of some 12,000 terms; subject-field usage cited. 3, 4, 5

### 580 Botany

Chinery, Michael. *A Science Dictionary of the Plant World*. Watts, 1969. \$4.95

Brief, simple definitions; good color drawings. 1, 2, 3, 4, 5

De Wit, H. C. *Plants of the World*. 3 vols. Dutton, 1966-69. \$19.95 each

Semipopular treatment with excellent photographs and drawings, some in color. Vol. 1: *Gymnosperms, Angiosperms, Dicots, Monocots*. Vol. 2: *Angiosperms, Dicots, Monocots*; Vol. 3: *Lower Plants: Bacteria, Algae, Molds, Lichens, Liverworts, Mosses, Ferns*. 3, 4, 5

Grimm, William C. *Home Guide to Trees, Shrubs, and Wildflowers*. Stackpole, 1970. \$9.95

Useful for identification. Divided into wet places, woodland, field and

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- wayside, and by spring, summer, late summer, fall. Indexes. 1, 2, 3, 4, 5
- Grimm, William C. *Recognizing Native Shrubs*. Stackpole, 1966. \$7.95  
For identifying particular plants within larger native shrub families. Bibliography, glossary, indexes. 1, 2, 3, 4, 5
- Kingsbury, J. M. *Poisonous Plants of the United States and Canada*. 3d ed. Prentice-Hall, 1964. \$17.25  
To confirm identification of plants whose parts are poisonous. Includes many common weeds and garden plants. Good index; bibliography. 4, 5
- Morton, Julia F. *Exotic Plants*. Golden, 1971. \$4.95, library binding.  
Introduction to plants that have been brought into the U.S. from other countries. All illustrations are in color. 1, 2, 3
- Rickett, H. W. *Wild Flowers of the United States*. McGraw-Hill, 1966-73. 6 vols. in 14 parts: Vol. 1: *Northeastern States*, 1966. \$65; Vol. 2: *Southeastern States*, 1967. \$47.50; Vol. 3: *Texas*, 1969. \$39.50; Vol. 4: *Southwestern States*, 1970. \$52.50; Vol. 5: *Northwestern States*, 1971. \$57.50; Vol. 6: *Central Mountains and Plains*, 1973. \$72  
Arranged by botanical families; excellent drawings and color photographs. Indexes to common and scientific names. Take your pick! 2, 3, 4, 5
- Taylor, Norman. *Guide to Garden Shrubs and Trees*. Houghton Mifflin, 1965. \$9.95  
For identifying or selecting trees and shrubs for the garden. Covers 500 of the more common species in the U.S. and Canada. 2, 3, 4, 5
- Usher, George. *Dictionary of Botany, including Terms in Biochemistry, Soil Science and Statistics*. Van Nostrand Reinhold, 1966. \$14.95  
Broad coverage, concise definitions; illustrations are mostly of organic molecules. 4, 5

590 Zoology

- Blair, William F. *Vertebrates of the United States*. 2nd ed. McGraw-Hill, 1968. \$21  
Thorough treatment with good drawings; keys for identification; good general and regional bibliographies. 2, 3, 4, 5
- Burton, Maurice. *University Dictionary of Mammals of the World*. Peter Smith, 1968. \$5.50  
Arranged by standard biological system; includes descriptions, ranges, breeding habits, food; good drawings, good index. 4, 5
- Chinery, Michael. *Science Dictionary of the Animal World*. Watts, 1969. \$4.95, library binding  
Brief, simple definitions; good color drawings. 1, 2, 3, 4, 5
- Grossman, Mary L., and Grossman, John H. *Birds of Prey of the World*. Potter, 1970. \$25  
Part I: prehistory, birds and man, ecology, habits, survival, conservation; Part II: for identification; good drawings, photographs. 2, 3, 4, 5
- Grzimek, Bernhard, ed. *Grzimek's Animal Life Encyclopedia*. 13 vols. Van Nostrand Reinhold, 1972-74. \$29.95 each. Vol. 1: *Lower Animals*; Vol. 2: *Insects*; Vol. 3: *Mollusks*; Vols. 4-5: *Fishes (and Amphibians)*; Vol. 6:

### Science Reference Materials

- Reptiles*; Vols. 7-9: *Birds*; Vols. 10-13: *Mammals*.  
Comprehensive coverage. Has animal dictionary, four-language common-name index, scientific name index, volume indexes, bibliographies. 1, 2, 3, 4, 5
- Money, Sali. *The Animal Kingdom*. Grosset, 1971. \$3.99, library binding  
Simple introduction to zoology with good color illustrations. 1, 2, 3
- Pennak, Robert W. *Collegiate Dictionary of Zoology*. Ronald, 1964. \$10.50  
Good definitions but no illustrations. Appendix is a taxonomic outline of the animal kingdom including extinct animals. 3, 4, 5
- Sparks, John. *Bird Behavior*. Grosset, 1970. \$3.99, library binding  
Simple introduction to birds; illustrations all in color. 1, 2, 3
- Stix, Hugh, and Stix, Marguerite. *The Shell*. Abrams, 1968. \$28.50  
Excellent guide to identification; covers the world. "500 million years of inspired design." 2, 3, 4, 5
- Swan, Lester A., and Papp, Charles S. *Common Insects of North America*. Harper, 1972. \$15  
Covers range, appearance, size, food, habitat of over 2,000 species. Excellent glossary, bibliography, indexes, but drawings vary in scale. 3, 4, 5
- Walker, Ernest P., et al. *Mammals of the World*. 2nd ed. 3 vols. John Hopkins, 1968. \$45 the set.  
Comprehensive, giving common and scientific names, habitats, ranges, size, abundance, color, natural history. Good photographs, bibliography. 4, 5

### 600 Technology

- Crispin, Frederic S. *Dictionary of Technical Terms*. Rev. ed. Macmillan, 1970. \$6.95  
Covers modern trades, industry, shopwork, technical procedures. 3, 4, 5
- Swezey, Kenneth M. *Formulas, Methods, Tips and Data for Home and Workshop*. Harper, 1969. \$7.95  
Very practical. Selection, finishing, preservation of wood; finishing, plating, working of metals; paints, paint removers; arts, crafts; etc. 2, 3, 4, 5
- The Way Things Work: An Encyclopedia of Modern Technology*. 2 vols. Simon and Schuster, 1971. \$9.95 each  
Over 400 common technical concepts and products described and explained; very clear diagrammatic illustrations. 1, 2, 3, 4, 5

### 610 Medicine and Health

- American Medical Association. *Today's Health Guide*. Latest ed. AMA. \$6.50 (paperback)  
General medical information and guidance covering the human body, mental and emotional health, drugs, and so on. Useful illustrations. 4, 5
- Dorland's Illustrated Medical Dictionary*. 24th ed. Saunders, 1965. \$13.50  
Comprehensive coverage. Includes section on medical etymology. Few but excellent plate illustrations. 3, 4, 5

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- Fishbein, Morris, ed. *New Illustrated Medical and Health Encyclopedia*. 4 vols. McKay, 1970. \$39.95  
Popular treatment, dictionary format. Index in Vol. 4. Could be good for health assignments. 3, 4, 5
- Gray, Henry. *Anatomy of the Human Body*. 29th ed. Lea and Febiger, 1973. \$28.50  
Standard work, frequently updated. Clear illustrations. Sections on embryology, anatomy, osteology, joints, muscles, nerves, heart, etc. 4, 5
- Lewis, Paul, and Rubenstein, David. *The Human Body*. Grosset, 1971. \$3.99, library binding  
Good introduction to the human body and its anatomy. All illustrations in color. 1, 2, 3
- Stedman, Thomas L., et al. *Stedman's Medical Dictionary*. 22nd ed. Williams and Wilkins, 1972. \$8.50  
Concise definitions, few illustrations. Appendixes on pharmaceutical preparations, blood groups, lab analysis, Latin terms, etc. 4, 5
- Thomson, William A., ed. *Black's Medical Dictionary*. 29th ed. Barnes and Noble, 1971. \$9  
Simpler explanations than Dorland or Stedman, but cheaper. Drawings and excellent photographs. 3, 4, 5

621.38 *Electronics*

- American Radio Relay League. *Radio Amateur's Handbook*. Rev. annually. ARRL. \$4.50  
Standard manual, reference work, covering operation of amateur radio communication equipment, concepts, policy, regulations. 4, 5
- Collins, A. Frederick. *Radio Amateur's Handbook*. 12th ed. Crowell, 1970. \$5.95  
Covers fundamentals of construction, elementary theory, regulations; some more complicated apparatus, solid-state devices, mobile equipment. 4, 5
- Markus, John. *Electronics and Nucleonics Dictionary*. 3d ed. McGraw-Hill, 1967. \$17.50  
Covers 16,338 terms more completely than an unabridged dictionary does. Good illustrations. 3, 4, 5

629 *Automotive and Space*

- Georgano, G. N., ed. *Complete Encyclopedia of Motorcars: 1885 to the Present*. 2d ed. Dutton, 1973. \$30  
Photographs, color plates, abbreviations, glossary, Anglo-American terminology, index to personalities, index to component parts makers. 2, 3, 4, 5
- Marks, Robert W., ed. *New Dictionary and Handbook of Aerospace*. Praeger, 1969. \$10  
Over 50,000 terms. Tables of planets, satellites, constellations, early U.S. and U.S.S.R. launchings. 2, 3, 4, 5
- Taylor, John W. *Aircraft*. Grosset, 1972. \$3.99, library binding  
Simple introduction to aircraft and their history. Good drawings and index. 1, 2, 3

## Science Reference Materials

### 630 Agriculture Including Animal Husbandry

- American Kennel Club. *The Complete Dog Book*. 11th ed. Howell, 1972. \$7  
The official publication of the AKC. Excellent descriptions, illustrations, and "point" scale for each breed. Glossary, index. 2, 3, 4, 5
- Brady, Irene. *America's Horses and Ponies*. Houghton Mifflin, 1969. \$9.95  
Scale drawings, detailed descriptions of all breeds of horses and ponies and many related animals. Includes directory. 3, 4, 5
- Cust, George, and Bird, Peter. *Tropical Freshwater Aquaria*. Grosset, 1971. \$3.99, library binding  
Simple introduction to tropical fish and aquarium care. All illustrations are in color. 1, 2, 3
- Graf, Alfred B. *Exotic Plant Manual*. 2nd ed. Scribner, 1973. \$32.50  
Gives identification, care, common and scientific names of ornamental plants often found in homes and green houses. Good illustrations. 3, 4, 5
- Hamilton, Ferelith. *World Encyclopedia of Dogs*. World, 1971. \$20  
Some 280 breeds are described, aided by 1,100 illustrations. 1, 2, 3, 4, 5
- Pirone, Pascal P. *Tree Maintenance*. 4th ed. Oxford, 1972. \$15  
Care and treatment of trees: planting, fertilizing, pruning, surgery, pest and fungi description and control. Site suggestions; illustrations. 3, 4, 5
- Pond, Grace, ed. *The Complete Cat Encyclopedia*. Crown, 1972. \$14.95  
Descriptions, standards, characteristics of breeds; anatomy, health problems; associations, shows; photographs, drawings. 3, 4, 5
- U. S. Department of Agriculture. *Diseases of Forest and Shade Trees of the U.S.* (Handbook No. 386). GPO, 1971. \$4  
Diseases listed under scientific names so a teacher or a librarian may have to help students in using the work. Comprehensive. Index. 4, 5
- U. S. Department of Agriculture. Agriculture Research Service. *Common Weeds of the U.S.* Dover, 1971. \$4.50 (paperback)  
Pictures and describes over 220 species; common names, scientific names, distribution maps; clear drawings, ample text. 2, 3, 4, 5
- Westcott, Cynthia. *Plant Disease Handbook*. 3d ed. Van Nostrand Reinhold, 1971. \$19.95  
Covers diseases, chemical treatment, plant pathogens, specific host-plant diseases. Ag experiment station list, glossary, bibliography, index. 3, 4, 5
- Wyman, Donald. (Diane Harris, ed.) *Wyman's Gardening Encyclopedia*. Macmillan, 1971. \$17.50  
Covers description, scientific names, selection, growing, new techniques, fertilizing practices. Well illustrated. 2, 3, 4, 5

### 677 Textiles

- American Fabrics Magazine, ed. *Encyclopedia of Textiles*. 2nd ed. Prentice-Hall, 1972. \$39.95  
Covers both man-made and natural fibers, their origins, history, inventors, fabric names, design, dyeing, weaving, testing. Dictionary. 2, 3, 4, 5



- Klapper, Marvin. *Fabric Manual*. 2nd ed. Fairchild, 1971. \$6.95  
Basically a dictionary plus U.S. fabric statistics, U.S. man-made fibers, natural fibers and their sources, and so on. 2, 3, 4, 5

### Biography

- American Council of Learned Societies. *Dictionary of Scientific Biography*. 12 vols. (8 vols. so far). Scribner, 1970-. \$35 each  
Will include 4,500 scientists and mathematicians from every region and period, similar in format to DAB and DNB. Bibliographies. 3, 4, 5
- American Men and Women of Science: Physical and Biological Sciences*. 12th ed. 6 vols. Bowker, 1971-73. \$210  
Concise biographies of American scientists with doctorates and/or with demonstrated abilities as by publication or achievement. 3, 4, 5
- Asimov, Isaac. *Asimov's Biographical Encyclopedia of Science and Technology*. Rev. ed. Doubleday, 1972. \$12.95  
Short biographies of 1,195 scientists from ancient times to the present, chronologically arranged with complete subject and name index. 2, 3, 4, 5
- McGraw-Hill *Modern Men of Science*. 2 vols. McGraw-Hill, 1966-68. \$22.50 each  
One or two pages each, with portrait sketch, on life and important contributions of scientists in the forefront of modern science. 3, 4, 5
- World Who's Who in Science*. Marquis, 1968. \$60  
Some 30,000 scientists from antiquity to the present, in typical condensed format but with ancients in essay form. Users may need help. 3, 4, 5

### Bibliographic and Other Aids

- Applied Science & Technology Index*, covering 225 periodicals, and *Biological & Agricultural Index*, covering 189, can be useful to both teachers and advanced students even though the library gets only a small number of the periodicals covered. H. W. Wilson Co., service basis. 4, 5
- Deason, Hilary J., comp. *AAAS Science Book List*. 3d ed. AAAS, 1970. \$10  
Selected and annotated list of 2,441 books in pure and applied sciences and mathematics for junior/senior high students, college undergraduates, and nonspecialists. 4, 5
- . *AAAS Science Book List for Children*. 3d ed. AAAS, 1972. \$8.95  
Selected and annotated list of science and math books for elementary school children and for children's collections in school and public libraries. 5
- American Association for the Advancement of Science. *AAAS Science Books*. AAAS, 1965-. \$12/year  
Current science and math books critically reviewed by scientists. Lists about 1,000 books and many science films each year, kindergarten through college level and for nonspecialists. 5
- . *Science for Society: A Bibliography*. 4th ed. AAAS, 1973. \$1  
Comprehensive citation list to some 4,000 books, journals, articles, and other publications concerned with current issues of science and society. 5

### *Science Reference Materials*

Children's Science Book Review Committee. *Appraisal: Children's Science Books*. 3 issues/year. CSBRC, 1967- . \$4/year

Current books reviewed by both librarians and specialists giving overall ratings and suggested age levels, preschool through 9th grade. 5

*Educators Guide to Free Science Materials*. 14th ed. Educators Progress Service, 1973. \$9.25

Audiovisual and other enrichment aids: charts, posters, magazines, pamphlets, etc.; classified, annotated; sources of materials given. 5

*New Unesco Source Book for Science Teaching*. Unesco, 1973. \$7.00

Do-it-yourself guide to equipment and experiments. Covers plants, animals, human body, rocks, minerals, astronomy, weather, soils, water, machines, magnetism, heat, energy, sound. 5

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## Science Media for the Elementary School Library

ROBERT E. MULLER

AN OPTIMUM COLLECTION of nonprint media for the elementary school library should cover the subject matter in the science curriculum in sufficient depth to enrich and complement the book collection. It should help the teacher teach and the learner learn; and it should be economically feasible.

A "basic list," i.e., an essential or fundamental one, is an improbable assumption; instead, an "optimum collection," i.e., one capable of producing the best results, is presented—a list from which the individual selector can evaluate and choose those specifics which meet his particular need. (Isn't this what librarians inevitably do with other librarian's lists anyway?) Space limitations preclude the inclusion of detailed descriptions, annotations and commentary; the user can find these details in the producer's catalogs, a collection of which is essential to nonprint selection.

The subject groupings correspond to common elementary science curricular areas, and naturally there is some overlapping. In general, sets of materials rather than individual items are listed (1) to save space and thus include more items, and (2) because audiovisual materials are generally purchased this way (although often cataloged, housed and circulated as individual items).

The list includes 587 sound (FSS) and captioned (FS) filmstrips, 73 sets of study prints (13 by 18 inch color lithographs), 20 sets of 2 by 2 inch slides, 9 sets of overhead transparencies, and 2 phonodiscs. The total cost at current catalog prices would be \$6,247.20 with phonodiscs; filmstrips with cassettes are generally higher in price.

A search of media bibliographies and reviews reveals a singular lack of new and up-to-date materials in several science areas. Biographies of scientists and inventors, prehistoric life, reptiles and amphibians, fish and sea life, astronomy and atomic energy all need new, contemporary treatments in more depth than is presently available.

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As always, local evaluation is essential to wise selection. A title may be good in every respect, but not particularly needed, while another title with perhaps many imperfections may be sorely needed. Selectors should also refer to *Resources for Learning; A Core Media Collection for Elementary School*<sup>1</sup> and to the eighth edition of *The Elementary School Library Collection*.<sup>2</sup>

## *References*

1. McDaniel, Roderick, ed. *Resources for Learning; A Core Media Collection for Elementary School*. New York, R.R. Bowker, 1971.
2. *The Elementary School Library Collection*. 8th ed. Mary V. Gaver, ed. Newark, N.J., Bro-Dart Foundation, 1973.

## *A Collection of Nonprint Media for the Elementary School Library*

### **Life Sciences**

#### *Nature Study*

Basic Nature Study. SVE,\* 1963. 10 FS \$52.50  
Concepts in Ecology. Centron, 1972. 4 FSS \$52.50  
Desert Life. Scott, 1972. 4 FS \$26  
Ecological Communities. Coronet, 1972. 6 FSS \$55  
Living Things in the City. Encyclopaedia Britannica, 1968. 9 FS \$54  
Plant and Animal Relationships. Encyclopaedia Britannica, 1965. 6 FS \$36  
Salt Water Communities. EMC, 1971. 3 FSS \$61.50  
Wild Young Desert. Lyceum, 1970. 2 FSS \$30  
Animal and Plant Communities. McGraw-Hill, n.d. 5 sets of 12 study prints \$67.50  
Discovering Vertebrates. Coronet, n.d. 5 sets of 8 study prints \$58  
Nature's Communities. SVE, 1973. 6 sets of 8 study prints \$48

#### *Animals*

Animal Life Histories. McGraw-Hill, 1966. 5 FS \$34  
Animal World. McGraw-Hill, 1969. 8 FS \$56  
Animals—Helpful and Harmful. Scott, 1962. 6 FS \$34  
Animals—How they Live and Grow. McGraw-Hill, 1965. 4 FS \$27  
Animals with Backbones. Encyclopaedia Britannica, 1964. 7 FS \$42  
Animals without Backbones. Encyclopaedia Britannica, 1964. 5 FS \$30  
Classification of Animals. Scott, 1962. 7 FS \$47  
Habitat Series. BFA, 1971. 5 FS \$40  
Investigating Vertebrates. Coronet, 1971. 5 FSS \$55  
Mammals of North America. Visual Publications, 1971. 4 FS \$28  
Vanished and Vanishing Species. AIMS, 1972. 4 FSS \$52  
\* A listing of producers may be found at the end of this list.

### *Science Media*

- Animals of Land and Sea. SVE, 1969. 6 sets of 8 study prints \$48  
Inside Look at Animals. IMED, 1973. 14 study prints \$14  
Introducing Animals. McGraw-Hill, 1969. 6 sets of 12 study prints \$67.50  
Common Mammals Found in Eastern North America. SVE, 1972. 20 2x2 slides \$9  
Common Mammals Found in Western North America. SVE, 1972. 20 2x2 slides \$9  
Animal Families. SVE, 1957. 12 transparencies \$60

### *Birds*

- Audubon's Birds of America. Encyclopaedia Britannica, 1953. 6 FS \$36  
Bird Study. SVE, 1958. 5 FS \$28.25  
Birds—How they Live and Help Us. SVE, 1954. 4 FS \$26.25  
Place of Birds in Nature. Imperial, 1971. 2 FSS \$22  
Common Birds. SVE, 1963. 8 study prints. \$8  
Common Land Birds of North America. Encyclopaedia Britannica, 1968. 10 study prints \$13.50  
Familiar Birds—Their Young and Nests. SVE, 1964. 8 study prints \$8  
Birds of the East. Outdoor Pictures, n.d. 50 2x2 slides \$19.50  
Birds of the West. Outdoor Pictures, n.d. 66 2x2 slides \$19.50  
Songbirds of America. Houghton Mifflin, n.d. 1 10" 33rpm phonodisc \$6.95  
Songbirds of America. Learning Arts. 1 12" 33rpm phonodisc \$5.95

### *Insects*

- Collecting Insects and Other Small Animals. Encyclopaedia Britannica, 1967. 5 FS \$30  
Helpful Insects. Encyclopaedia Britannica, 1969. 5 FS \$36  
Insect Life Cycles. Encyclopaedia Britannica, 1964. 5 FS \$30  
Insect Societies. Scott, 1966. 3 FS \$17  
Insects: How they Live and Grow. Encyclopaedia Britannica, 1962. 5 FS \$30  
Investigating Insects. Coronet, 1972. 6 FSS \$55  
Common Insects. SVE, 1963. 8 study prints \$8  
Insects Harmful to Man. Encyclopaedia Britannica, n.d. 10 study prints \$13.50  
Moths and Butterflies. SVE, 1968. 8 study prints \$8  
Common Insects and Spiders. SVE, 1969. 20 2x2 slides \$9  
Common Insect Pests. SVE, 1973. 20 2x2 slides \$9  
Insects and Other Arthropods. SVE, 1970. 20 2x2 slides \$9

### *Fish and Sea Life*

- How to Make a Fresh-Water Aquarium. Troll, 1971. 1 FS \$6.50  
How to Make a Salt-Water Aquarium. Troll, 1971. 1 FS \$6.50  
Science of the Sea. BFA, 1971. 8 FSS \$84  
Underwater Environment. Imperial, 1970. 4 FSS \$44  
Familiar Fresh-Water Fish. SVE, 1964. 8 study prints \$8  
Marine Life. Audio-Visual Enterprises, 1969. 12 study prints \$15  
Common Fresh-Water Fishes. SVE, 1973. 20 2x2 slides \$9

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*Reptiles and Amphibians*

- American Reptiles in Their Environment. Imperial, 1969. 2 FSS \$22  
Reptiles and Amphibians. SVE, 1964. 8 study prints \$8  
Amphibians and Reptiles. SVE, 1964. 20 2x2 slides \$9  
Common Reptiles and Amphibians. SVE, 1973. 20 2x2 slides \$9  
Common Snakes. SVE, 1973. 20 2x2 slides \$9

*Plants and Flowers*

- Flowering Plants: Their Structure and Function. Encyclopaedia Britannica, 1967 5 FS \$30  
How Flowers Transfer Pollen. Imperial, 1970. 5 FSS \$55  
Introduction to Plants. SVE, 1964. 2 FSS \$19  
Leaf Functions. BFA, 1969. 5 FS \$35  
Learning About Plants. Encyclopaedia Britannica, 1962. 6 FS \$36  
Plant Responses to Environmental Conditions. BFA, 1969. 5 FS \$38  
Plants: How They Live and Grow. Encyclopaedia Britannica, 1962. 6 FS \$36  
Role of Fruits and Flowers. SVE, 1964. 2 FSS \$19  
Seed Plants. Coronet, 1969. 8 FSS \$65  
Wild Flowers of North America. Encyclopaedia Britannica, 1968. 10 FS \$60  
Spring Wildflowers. SVE, 1963. 8 study prints \$8  
Fruits and Seeds. SVE, 1970. 20 2x2 slides \$9  
Plant Adaptation. SVE, 1971. 20 2x2 slides \$9  
Plant Parts. SVE, 1969. 20 2x2 slides \$9  
Plants That Do Not Flower. SVE, 1971. 20 2x2 slides \$9

*Trees*

- Forests of the Americas. Encyclopaedia Britannica, 1967. 4 FS \$24  
Role of Trees in the Environment. Imperial, 1970. 4 FSS \$44  
This Unique Bit of Life . . . Trees and Our Environment. Guidance Associates, 1972. 1FSS \$18  
Trees. Coronet, 1970. 6 FSS \$50  
Broadleaf Trees. SVE, 1964. 8 study prints \$8

*Prehistoric Life*

- Fossils. Encyclopaedia Britannica, 1967. 5 FSS \$55  
Life Long Ago. SVE, 1958. 6 FS \$33.90  
Prehistoric Life. Encyclopaedia Britannica, 1953. 6 FS \$36  
Prehistoric Plants and Animals. AIMS, 1972. 6 FS \$45  
Learning about Dinosaurs. Encyclopaedia Britannica, n.d. 10 study prints \$13.50  
Introduction to Fossils. SVE, 1972. 40 2x2 slides \$18

*Conservation and Ecology*

- Case of the Bighorn Sheep. Schloat, 1971. 2 FSS \$36  
Ecological Crisis. SVE, 1971. 6 FSS \$69  
Ecology: Understanding the Crisis. Encyclopaedia Britannica, 1972. 6 FSS \$70.20

### *Science Media*

Environmental Studies. Centron, 1972. 6 FSS \$72.50  
Man's Natural Environment: Crisis Through Abuse. Guidance Associates,  
1970. 2 FSS \$41.50  
Pollution. Coronet, 1972. 6 FSS \$55  
What is Ecology? Schloat, 1972. 2 FSS \$23  
Discovering Our Environment. Coronet, 1972. 4 sets of 10 study prints \$58

### **Physical Science**

#### *Earth Science*

Discovering Rocks and Minerals. Coronet, 1970. 4 FSS \$32.50  
Earth's Resources. McGraw-Hill, 1972. 6 FS \$41  
Glaciers and the Ice Age. Encyclopaedia Britannica, 1966. 4 FSS \$44  
Investigating Rocks. Encyclopedia Britannica, 1969. 9 FSS \$99  
Investigations in Science: Earth Science. BFA, 1971. 5 FSS \$45  
Man's Earth Home. Encyclopaedia Britannica, 1970. 8 FS \$57.60  
Physiographic Changes. SVE, 1962. 6 FS \$33.90  
Rocks and Minerals. SVE, 1962. 4 FS \$22.60  
Common Rocks and Rock-Forming Minerals. SVE, 1964. 8 study prints \$8  
Earth Science Series. Instructional Aids, 1968. 18 sets of 6 study prints \$125.10  
Volcanoes. Encyclopaedia Britannica, 1972. 10 study prints \$13.50  
Erosion of the Earth's Crust. SVE, 1971. 20 2x2 slides \$9  
Landforms on the Earth's Crust. SVE, 1970. 20 2x2 slides \$9  
Weathering and Erosion. SVE, 1971. 20 2x2 slides \$9  
Geology. SVE, 1966. 18 transparencies \$87

#### *Water and Oceans*

Man and the Ocean. Nystrom, 1971. 5 FSS \$75  
Ocean is Many Things. Imperial, 1969. 6 FS \$42  
Oceanography. Coronet, 1971. 6 FSS \$55  
Water and How We Use It. Coronet, 1972. 6 FSS \$55  
Land Forms of Running Water. SVE, 1964. 8 study prints \$8

#### *Weather and Seasons*

Atmosphere. EMC, 1971. 4 FSS \$69  
Basic Weather. SVE, 1960. 4 FS \$22.50  
Changing Seasons. SVE, 1971. 4 FSS \$36.50  
Clouds and Rain and Things. Guidance Associates, 1972. 2 FSS \$19.50  
Exploring All the Seasons. Imperial, 1970. 4 FSS \$44  
Four Seasons in the City. Hudson Photographic Industries, 1969. 4 FSS \$57  
Meteorology. Eye Gate House, 1969. 4 FSS \$37  
Seasons, Weather and Climate. Scott, 1952. 5 FS \$28  
Understanding the Atmosphere. Scott, 1961. 6 FS \$40  
Understanding Weather and Climate. SVE, 1965. 6 FSS \$52.50  
Day and Night and the Seasons. Encyclopaedia Britannica, n.d. 10 study prints  
\$13.50  
Familiar Cloud Forms. SVE, 1964. 8 study prints \$8  
Weather Instruments. Instructional Aids, 1967. 6 study prints \$7



ROBERT E. MULLER

Climate and Clouds. SVE, 1970. 20 2x2 slides \$9  
Signs of the Seasons. SVE, 1971. 4 sets of 20 2x2 slides each \$9  
Meteorology. SVE, 1964. 9 transparencies \$34.50

*Astronomy and Space*

Astronomy in the Space Age. Eye Gate House, 1969. 8 FSS \$61  
Man on the Moon. Doubleday Multimedia, 1972. 5 FSS \$93  
Man Reaches the Moon. Imperial, 1969. 2 FSS \$22  
Space. SVE, 1973. 6 FSS \$43  
Space Science for Elementary Grades. Centron, 1970. 4 FSS \$72.50  
Story of Space Flight. Coronet, 1972. 4 FSS \$55  
Traveling in Space. Doubleday Multimedia, 1972. 5 FSS \$63  
What's Out There? Scott, 1971. 7 FS \$47  
Understanding Our Earth and Universe. SVE, 1965. 6 FSS \$52.50  
Exploring Space. SVE, 1968. 4 sets of 8 study prints \$32  
Astronomy. SVE, 1964. 11 transparencies. \$54.50  
Universe. Instructo, 1966. 7 transparencies. \$35

*Energy and Matter*

Atom and Its Nucleus. Scott, 1955. 7 FS \$47  
Atoms and Their Energy. Filmstrip House, 1971. 4 FS \$32  
Introduction to Matter and Energy. SVE, 1967. 5 FSS \$45  
Investigating Relationships in Matter. Mealey, 1971. 4 FSS \$64  
Properties of Matter. BFA, 1969. 5 FSS \$60  
Structure of Matter. Filmstrip House, 1968. 4 FSS \$30  
Structure of the Atom. Filmstrip House, 4 FSS \$30

*Electricity and Magnetism*

Electricity. Encyclopaedia Britannica, 1968. 7 FS \$42  
Electricity at Work. SVE, 1970. 6 FSS \$49.50  
Investigating Electricity. Coronet, 1973. 6 FSS \$45  
Magnets. Scott, 1960. 6 FS \$34  
Understanding Electricity. SVE, 1966. 4 FS \$34.50  
Magnetism and Electricity. SVE, 1967. 12 transparencies. \$48

*Light, Color, Sound, Heat*

Color and its Perception. Coronet, 1971. 3 FSS \$25  
Heat, Light and Sound. Scott, 1959. 7 FS \$40  
Hot and Cold. Encyclopaedia Britannica, 1969. 6 FS \$36  
Learning About Sounds. Encyclopaedia Britannica, 1970. 5 FSS \$58.50  
Light. BFA, 1970. 6 FS \$48  
Light. SVE, 1967. 6 transparencies \$23  
Sound. SVE, 1967. 6 transparencies \$27

*Mechanics and Machines*

Inventions and Technology that Shaped America. Learning Corp. of America,  
1971. 3 sets of 6 FSS each \$59  
Investigating Simple Machines. Coronet, 1971. 6 FSS \$53

### *Science Media*

New Insights: A New Look at Things. Troll, 1970. 6 FS \$36  
Work of Simple Machines. SVE, 1964. 5 FSS \$45  
Machines. SVE, 1967. 6 transparencies \$27


### *Science Processes*

How to Read Science. Filmstrip House, 1972. 4 FSS \$35  
Science Processes: Classifying. McGraw-Hill, 1970. 6 FS \$41  
Science Processes: Experimenting. McGraw-Hill, 1970 6 FS \$41  
Science Processes: Measuring. McGraw-Hill, 1970. 6 FS \$41  
Science Processes: Observing and Describing. McGraw-Hill, 1970. 6 FS \$41

### **Producers**

AIMS Instructional Media Services, Box 1010, Hollywood, Cal. 90028  
Audio-Visual Enterprises, 611 Laguna Blvd., Pasadena, Cal. 91105  
BFA Educational Media, 2211 Michigan Ave., Santa Monica, Cal. 90404  
Centron Educational Films, 1621 West 9th St., Lawrence, Kans. 66044  
Coronet Films, 65 E. South Water St., Chicago, Ill. 60601  
Doubleday Multimedia, Box 11607, Santa Ana, Cal. 92705  
EMC Corp, 180 E. 6th St., St. Paul, Minn. 55101  
Encyclopaedia Britannica, 425 No. Michigan Ave., Chicago, Ill. 60611  
Eye Gate House, 1406-01 Archer Ave., Jamaica, N.Y. 11435  
Filmstrip House, 432 Park Ave. South, New York, N.Y. 11016  
Guidance Associates, 25 Washington Ave., Pleasantville, N.Y. 10570  
Houghton Mifflin Co., 110 Tremont St., Boston, Mass. 02107  
Hudson Photographic Industries, Irvington-on-Hudson, N.Y. 10533  
Instructional Materials and Equipment Distributors, Box 49695, Los Angeles, Cal. 90049  
Imperial Film Co., Box 1007, Lakeland, Fla. 33802  
Instructional Aids, Box 191, Mankato, Minn. 56001  
Instructo Corp., Paoli, Pa. 19301  
Learning Arts, Box 917, Wichita, Kans. 67201  
Learning Corp. of America, 711 Fifth Ave., New York, N.Y. 10022  
Lyceum, Box 487, Altadena, Cal. 91001  
McGraw-Hill Films, 1221 Avenue of the Americas, New York, N.Y. 10020  
Joseph Mealey and Associates, Box 233, Timonium, Md. 21093  
A.J. Nystrom and Co., 3333 Elston Ave., Chicago, Ill. 60618  
Outdoor Pictures, Box 277, Anacortes, Wash. 98221  
Warren Schloat Productions, 150 White Plains Rd., Tarrytown, N.Y., 10591  
Scott Educational Division, 104 Lower Westfield Rd., Holyoke, Mass. 01040  
Society for Visual Education (SVE), 1345 Diversey Parkway, Chicago, Ill. 60614  
Troll Associates, 320 Rt. 17, Mahwah, N.J. 07430  
Visual Publications, Box 297, Champlain, N.Y. 12919

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## Audiovisual Materials for Young Adults

SELMA K. RICHARDSON

THE COLLECTION listed below is meant to be a pot-pourri for public libraries and secondary school libraries desiring to begin incorporating nonbook materials into their collections for young adults. The items represent a variety of subjects, different treatments of topics, and several media formats. The titles selected range from the single audio recording to series of 8mm film loops, and thus from the inexpensive to the costly. Each librarian will need to assess the needs of his clientele to determine high priority titles which would be most useful and fulfill several purposes. Most of the media can serve the dual function of supporting instruction and insuring fascinating hours of browsing.

The titles on the list satisfactorily meet the generally accepted criteria of evaluation: authenticity, appropriateness, and technical quality. It should, however, be noted that in order to make the collection diverse, yet keep the size manageable, many fine titles were not included. Most entries are fairly recent publications.

For many years high school offerings in science have been categorized under biology, chemistry, physics, and earth science. Within courses, however, the lines of demarcation are not so easily drawn since each relies upon and supports the others. Many courses are now offered in which the integration is deliberate. The recent addition to the science curriculum of environmental studies and specifically the interest in ecosystems not only further unifies the sciences, but also thrusts science into interdisciplinary ventures. Many recent publications reflect this approach to the discipline of science. For these reasons this bibliography has been cast in one alphabetic list. One need only try to categorize some of the entries to sense the way in which the titles overlap several areas of science.

The media included in the list are filmstrips, 8mm film loops, 35mm slides, and audio recordings. Not included are 16mm films, although it

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Selma K. Richardson is Chairman of Media Services, Oak Park and River Forest High School, Oak Park, Illinois.

is recognized that secondary schools rent and purchase many science films.

The materials selected are appropriate mainly for students in grades nine through twelve. The people in this age group have abilities that range widely above and below this narrow span. It is intended that the selected items be of use to the broader range of abilities. Items on Muller's elementary school library nonprint media list in this issue are not reported on this list, although many would also be useful for older students and many items on the list for young adults will be helpful to some elementary school children.

### ***Materials List***

Aggradation—Degradation. Eye Gate, 1970. 10 sound filmstrips, with discs \$85, with tape cassettes \$87.50

Series includes: An Overview, Atlantic Coastal Plain, Appalachian Highland and Piedmont, The Great Central Plain, Mississippi River System, Rocky Mountain—Great Basin, The Pacific Coast, Interdependent People, Niagara: River with the Wandering Waterfall (Part I), Niagara: River with the Wandering Waterfall (Part II).

The Chesapeake at Bay: An Ecological Study. Joseph Mealey, 1971. 2 sound filmstrips with discs or tape cassettes, \$32

Dissection of a Frog. Library Filmstrip Center, 1971. 2 sound filmstrips, with discs \$42, with tape cassettes or reel-to-reel \$46

DNA and Cell Reproduction. Thorne 1970. 9 8mm film loops, \$24 each

Series includes: Extracting DNA, DNA—Composition, Giant Chromosomes of *Drosophila*, Fruit Fly Chromatography, Paramecium III Reproduction, Fertilization, Bacterial Sensitivity to Radiation, Regeneration in Flatworms, Pollen Tube Growth.

Earth Science, Sets I and II. McGraw-Hill, 1972. 14 8mm film loops, \$260, \$20 each

Series includes: Coastal Processes, Deep Ocean Sediments and Turbidity Currents, Fronts, Glaciation, Hurricanes, Igneous Processes, Metamorphism and Coal Formation, Crustal Evolution, Ocean Basin Topography, Ocean Currents, Sedimentation and Sedimentary Rocks, Stream Action, Thunderstorms, Wind Erosion and Deposition.

Evolution of Animal Life: Evidence and Theory. Denoyer-Geppert, 1972. 35 mm slides, 4 carousel cartridges, \$120

Series includes: The Idea of Evolution: History and Development, Animal Classification and Evolution, Geographic Distribution and Evolution, Animal Structure and Evolution.

Fresh Water Environments. Thorne, 1970. 8 8 mm film loops, \$24 each

Series includes: The Pond Environment—I Plankton, The Pond

### *Audiovisual Materials*

- Environment—II Organisms Inhabiting Aquatic Vegetation, The Pond Environment—III Organisms Using the Surface Film, The Pond Environment—IV Bottom Inhabitants, The Stream Environment—I Aquatic Insects Part 1, The Stream Environment—II Aquatic Insects Part 2, The Stream Environment—III Aquatic Insects Part 3, Identification of Fresh Water Organisms.
- General Geology. Harper & Row, 1972. 100 35 mm slides, \$75
- The Gods Were Tall and Green. Lyceum, 1972. 2 sound filmstrips, with discs \$34, with tape cassettes \$40  
Series includes: The Kingdom of the Forest, Trees: An Ancient Kinship.
- I Can't Hear You, I've Got Pollution in My Ear! Center for Cassette Studies, 1971. Tape cassette, \$14.95
- Investigations in Science: Energy and Motion Series. BFA, 1969. 5 8 mm film loops, \$24 each  
Series includes: Work, Kinetic Energy, Potential Energy, Inertia, Acceleration.
- Laboratory Safety. Harper & Row, 1971. 5 8mm film loops, \$25 each  
Series includes: Basic Laboratory Safety, Handling Reagents, Accident Prevention, Laboratory Emergencies, Laboratory First Aid.
- The Language and Music of the Wolves. Natural History Magazine, distributed by Columbia Records, 1971. Stereo disc, \$5.98
- The Last Frontier: Oceans. New York Times, 1972. Sound filmstrip with disc, \$9
- Life Before Birth. Time-Life Films, 1972. 2 sound filmstrips with discs or tape cassettes, \$35
- Marine Environments. Thorne, 1970. 6 8mm film loops, \$24 each  
Series includes: The Rocky Coast Environment—I High Tide Zone, The Rocky Coast Environment—II Mid-tide Zone, The Rocky Coast Environment—III Low-tide Zone, The Sandy Beach Environment, The Mud Flat Environment, Identification of Marine Organisms.
- Minerals. Denoyer-Geppert, 1971. 35mm slides, 3 carousel cartridges, \$90  
Series includes: Field Identification of Minerals, Laboratory Analysis of Minerals, Minerals and Crystals, Radioactive Minerals, Minerals of Economic Importance, Optical Properties of Minerals.
- New York City: An Environmental Case Study. Denoyer-Geppert, 1971. 2 sound filmstrips with disc, \$34
- The Origin of Life. Harper & Row, 1972. 5 8mm film loops, \$25 each  
Series includes: Formation of Amino Acids, Preparation and Properties of Proteinoids, Preparation of Microspheres, Properties of Proteinoid Microspheres, Answers to Questions about the Origin of Life.
- The Origins of the Earth. Visual Publications, 1972. 12 filmstrips, \$8 each  
Series includes: Fold Mountains, Volcanoes I, Volcanoes II, The Sea I: Erosion, The Sea II: Deposition, Rocks and Minerals, Rivers I, Rivers II, Rivers III, Ice I: Glaciation in Lowlands, Ice II: Glaciation in Highlands—Erosion, Ice III: Glaciation in Highlands —Deposition.

SELMA K. RICHARDSON

- Osmosis. Thorne, 1970. 4 8mm film loops, \$24 each  
Series includes: Physcial Changes in Plant Tissue, Movement of Water, Effect on Cell Membranes, Dialysis.
- Our Polluted World: The Price of Progress. Current Affairs, 1972. Filmstrip, with disc \$17.50, with tape cassette \$19.50
- The Periodic Table. Denoyer-Geppert, 1972. 35mm slides, 2 carousel cartridges, \$120  
Series includes: Physical Properties, Chemical Properties.
- Photosynthesis. Thorne, 1970. 5 8mm film loops, \$24 each  
Series includes: End Products, Effect of Light Intensity, Effect of Wave Length, Absorption of Light by Chlorophyll, Pigments.
- Plant Classification. Eye Gate. 6 filmstrips, with discs \$57, with tape cassettes \$58.50  
Series includes: The Why and How of Plant Classification, Algae, Fungi and Lichens, Mosses and Liverworts, Clubmosses, Horsetails and Ferns, Cone-Bearing Plants, Flowering Plants.
- Sickle Cell . . . an Inherited Disease. Glenn Educational Films, 1972. Sound filmstrip, with disc \$19.50, with cassette \$25
- Soil: Its Meaning for Man. Warren Schloat Productions, 1972. 2 sound filmstrips, with discs \$40, with tape cassettes \$46
- Songs of the Humpback Whale. CRM Records, distributed by Capitol Records, 1970. Disc, \$4.98
- Songs of Western Birds. Dover, 1971. Disc, \$3
- Space. Visual Publications, 1971. 10 filmstrips, \$63, \$7 each  
Series includes: History of Astronautics, Our Place in the Universe, Space Rockets, Man in Space, Man-made Satellites, Exploring the Solar System, Steps to the Moon, Journey to the Moon.
- Speaking of Science: Conversations with Outstanding Scientists. American Association for the Advancement of Science, 1972. 6 tape cassettes, \$39.95  
Series includes: Discovering Mars, Evolution and the Descent of Man, Advances in the Behavioral Sciences, What Is Needed for Peace?, Health Care and Delivery, Advances in the Physical and Life Sciences, Advances in the Ocean Sciences, Public Understanding of Science, Technology Today, The Finite Earth, Advances in Astronomy, Noise and Music.
- Story of the Everglades. Warren Schloat Productions, 1972. 2 sound filmstrips, with discs \$40, with tape cassettes \$46.
- Terrestrial Organisms. Thorne, 1970. 15 8mm film loops, \$24 each  
Series includes: Nematode, Land Snail, Earthworm, Millipede, Centipede, Black Widow Spider, Scorpion, Tick, Isopod, Ladybird Beetle, Aphids, Pipevine Swallowtail, Opalina, Trypanosoma, Trichonympha.
- Trees for 2001. Guidance Associates, 1973. Sound filmstrip, with disc \$19.50, with tape cassette \$22
- Visual Teaching Slide Sets. Visual Teaching, 1970. 35mm slides, 30 sets, 20 slides per set, \$12 each set  
Series includes: Life History of the Peanut; Life History of Popcorn; Ladybug Beetle, Bean Beetle, Weevil, Harlequin Bug, and Ambush

### *Audiovisual Materials*

Bug; Protective Color in Insects; Life History of the Dandelion; Life History of the Milkweed; Birds in Winter; Common Reptiles and Amphibians; Wild Edible Plants; Flowers of the Field I; and 20 other titles.

The Wetlands. Warren Schloat Production, 1972. 2 sound filmstrips, with discs \$40, with tape cassettes \$46

Why Skin Has Many Colors. Sunburst, 1973. 2 sound filmstrips with discs or cassettes, \$40

*The librarian might want to consult the catalogs of The Center for Cassette Studies, Warren Schloat Productions, and Thorne Films, as well as reviewing media, for titles to substitute for those listed in this bibliography by these producers.*

### **List of Publishers of Audiovisual Materials**

(Includes only those not listed by Muller on p. 523)

American Association for the Advancement of Science, 1414 Massachusetts Ave., N.W., Washington, D.C., 20005

Center for Cassette Studies, 8110 Webb Ave., N. Hollywood, Cal. 91605

Current Affairs, 24 Danbury Rd., Wilton, Conn. 06897

Denoyer-Geppert Audio-Visuals, 5235 Ravenswood Ave., Chicago, Ill. 60640

Dover Publications, 180 Varick St., New York, N.Y. 10014

Glenn Educational Films, Monsey, N.Y. 10952

Harper & Row, Keystone Industrial Park, Scranton, Pa. 18512

Library Filmstrip Center, 3033 Aloma, Wichita, Kans. 62211

Lyceum Production, P.O. Box 1226, Laguna Beach, Cal. 92652

New York Times, 229 W. 43rd St., New York, N.Y. 10036

Sunburst Communications, Pound Ridge, N.Y. 10576

Thorne Films, 1229 University Ave., Boulder, Colo. 80302

Time-Life Films, Time-Life Bldg., Rockefeller Center, New York, N.Y. 10020

Visual Publications, 716 Center St., Lewiston, N.Y. 14092

Visual Teaching, 79 Pineknob Terrace, Milford, Conn. 06460



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# *Library Trends*

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# Library Trends

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January, 1975, *Music and Fine Arts in the General Library*. Editors: Guy A. Marco, Dean, School of Library Science, Kent State University, Kent, Ohio; and Wolfgang Freitag, Fine Arts Librarian, Harvard University, Cambridge, Massachusetts.

April, 1975, *Effective Resource Allocation in Library Management*. Editor: H. William Axford, University Librarian, University of Oregon, Eugene, Oregon.